

Audi A4 1995 ➤

4-Cylinder engine (5-valve), Mechanics

Engine ID	ADR	AFY	APT	ARG	AVV				
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Edition 10.1997



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List of Workshop Manual Repair Groups

Audi A4 1995 ➤

4-Cylinder engine (5-valve), Mechanics

Repair Group

00 - Technical data

10 - Removing and installing engine

13 - Crankshaft group

15 - Cylinder head, Valve gear

17 - Lubrication

19 - Cooling system

20 - Fuel supply system

26 - Exhaust system

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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Audi A4 1995 ➤

Audi 4-Cylinder engine (5-valve), Mechanics - Edition 10.1997



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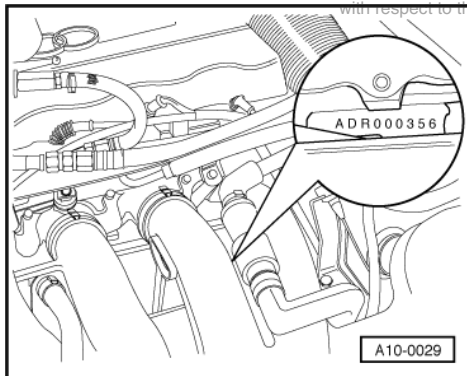
00 - Technical data

1 - Technical data

1.1 - Technical data

1.2 - Engine number

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-> The engine number ("Engine code" and "Serial number") can be found on the left of the cylinder block. Additionally there is a sticker on the cylinder head cover giving the "Engine code" and "Serial number". The engine code is also included on the vehicle data sticker.

Note:

The engine code is also stamped on the front engine lifting eye (can be seen by removing the cover above the injectors).

1.3 - Engine data

Engine code		ADR	AFY
Manufactured		11.94 ä	04.95 ▶
Displacement	ltr.	1.781	1.781
Power	kW	92	88
	at rpm	5800	5800
Torque	Nm	168	164
	at rpm	3500	3500
Bore	mm	81.0	81.0
Stroke	mm	86.4	86.4
Compression ratio		10.3:1	9.2:1
RON		95unleaded	88 unleaded or leaded
Injection/ignition system		Bosch Motronic	Bosch Motronic
Knock control		yes	yes
Self-diagnosis		yes	yes



Engine code	ADR	AFY
Lambda control	yes	yes
Catalytic converter	yes	no
Charging	no	no
Exhaust gas recirculation	no	no

Engine code	ADR	AFY
Intake manifold change-over function	08.97 ➤	no
Camshaft timing control	08.97 ➤	no
Valve timing		
At 1 mm valve lift and 0 mm valve clearance		
Intake opens after TDC	4°	4°
Intake closes after BDC	34°	34°
Exhaust opens before BDC	38°	38°
Exhaust closes before TDC	8°	8°

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10 - Removing and installing engine

1 - Removing and installing engine

1.1 - Removing and installing engine

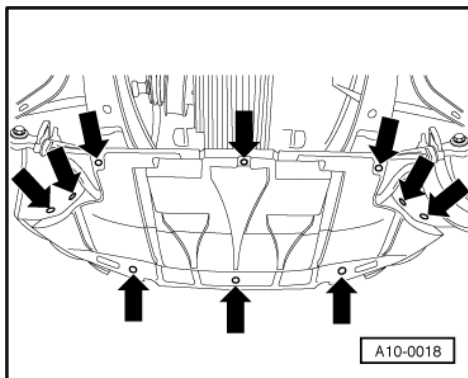
Special tools, testers and auxiliary items

- ◆ Engine support bracket 10-222A with legs 10-222A/1
- ◆ Lifting tackle 2024 A with extension 2024 A/1 and bar 2024 A/2
- ◆ Gearbox support 3147
- ◆ Pin 3204
- ◆ Workshop crane V.A.G 1202 A
- ◆ Drip tray V.A.G 1306
- ◆ Pliers V.A.G 1921 for spring type clips
- ◆ Bolt M5 x 60
- ◆ Socket 15 mm A/F, Matra V175
(for vehicles with automatic gearbox)

1.2 - Removing

Notes:

- ◆ All cable ties which are opened or cut open when removing the engine must be replaced in the same position when installing the engine.
- ◆ The engine is removed from the front without the gearbox.
- ◆ Catch drained-off coolant in a clean container for re-use or disposal.
- Obtain radio code on vehicles with coded radio.
- Run windscreen wipers to vertical position.



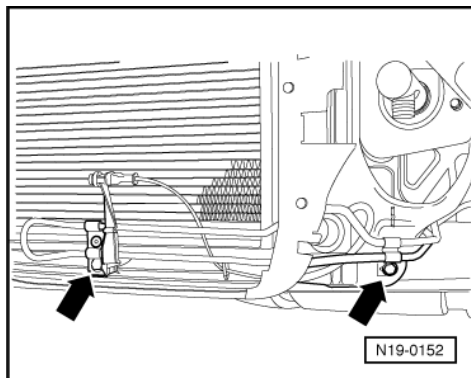
- With ignition switched off, disconnect battery earth strap.
- Open cap on coolant expansion tank.
- Remove front bumper:

=> General body repairs; Repair group 63; Front bumper; Removing and installing front bumper

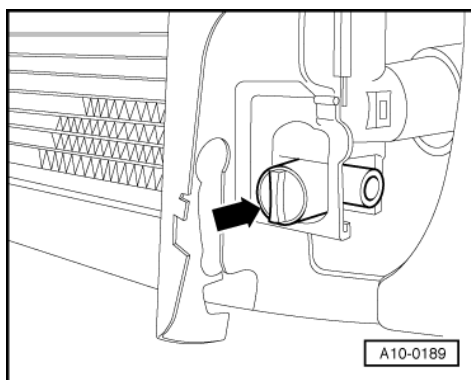
- -> Remove noise insulation -arrows-.



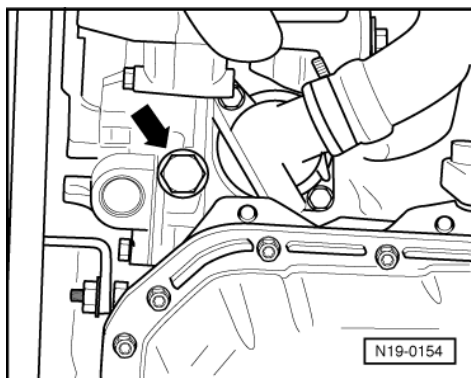
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- ➔ Unbolt power steering hydraulic fluid cooling pipe -arrows- and ensure it is free. Do not open hydraulic fluid circuit.
- Loosely secure bracket for temperature sensor for ambient temperature indicator in its original position.



- Place drip tray V.A.G 1306 below engine.
- ➔ Turn drain screw -arrow- on radiator towards the left, if necessary fit drain hose to connection.
- Pull off retaining clip for bottom coolant hose and detach coolant hose from radiator.



- ➔ Also open drain screw -arrow- on coolant pump bearing housing.
- Detach coolant hose from connection for thermostat.

Vehicles with automatic gearbox

- Place drip tray V.A.G 1306 underneath.
- Disconnect ATF pipes going to radiator:

=> Automatic gearbox 01N; Repair group 37; Dismantling and assembling gearbox; Removing and installing ATF pipes

- Unbolt bracket for ATF pipes from engine.



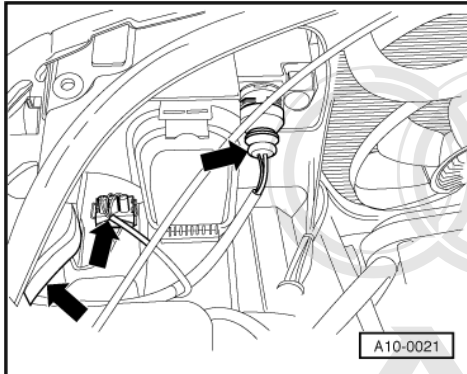
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Vehicles with electric radiator fan:

- Unplug connector from radiator fan thermoswitch -F18/-F54 on radiator (bottom left) and move wiring clear.

All models

- Unbolt and remove air duct leading to air cleaner (air duct is bolted to lock carrier).

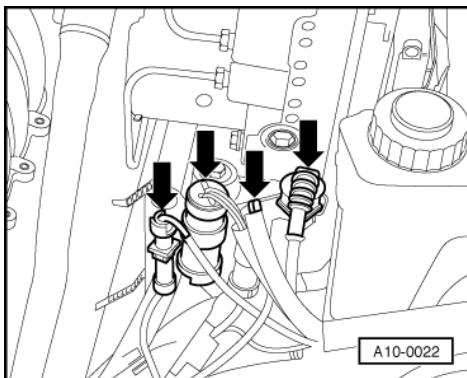


- -> Unplug connectors for headlights and headlight range control -arrows-.
- Turn bulb holders for turn signals anti-clockwise and remove from turn signal housing -left arrow-.
- Detach radiator hose at upper coolant pipe.
- Detach bonnet lock cable from lock carrier.

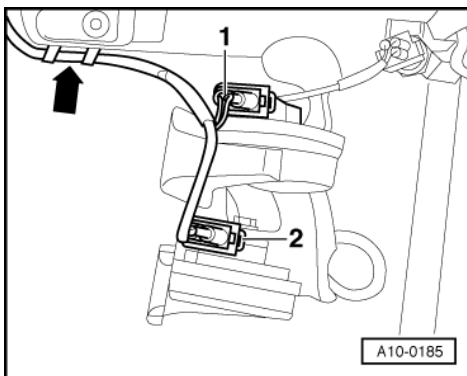
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=> General body repairs; Repair group 55; Bonnet; Removing and installing bonnet lock cable Bonnet Removing and installing bonnet lock cable

- Detach cover from power steering fluid reservoir.



- -> Unplug connectors located in front of ABS unit -arrows- and move wiring clear.
- Unplug connector for anti-theft alarm on lock carrier (top left) and move wiring clear.



- -> Unplug connectors from both horns -1- and -2-, disengage wiring from bracket -arrow- and move wiring clear.



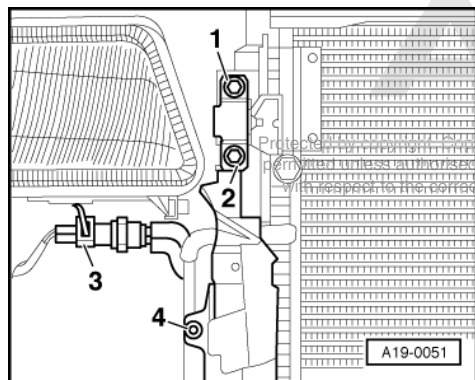
Vehicles with air conditioner:

Warning!

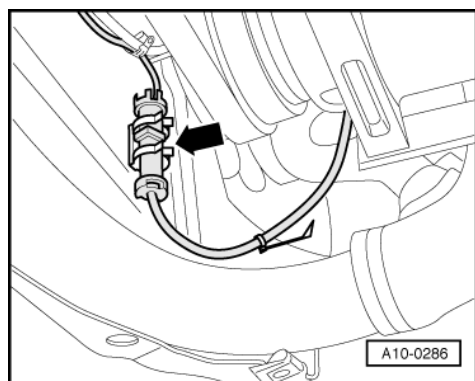
The air conditioner refrigerant circuit must not be opened.

Note:

To prevent damage to the condenser and refrigerant pipes/hoses, ensure that the pipes and hoses are not stretched, kinked or bent.



- -> Unbolt air cowls on left and right sides of radiator -4-.
- Remove securing bolts -1- and -2- for condenser.
- Pull connector -3- off low pressure switch for air conditioner -F73.
- Pull condenser up out of its bracket, rotate towards the side and secure in place on front right wheel with wire.



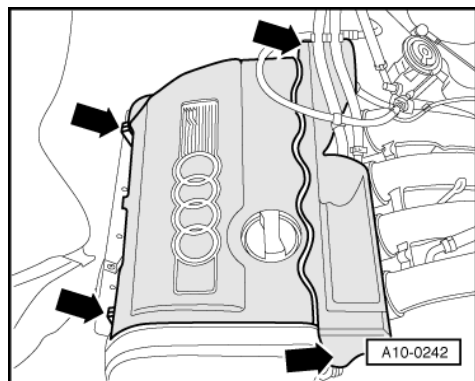
Note:

Protect wing panel from damage.

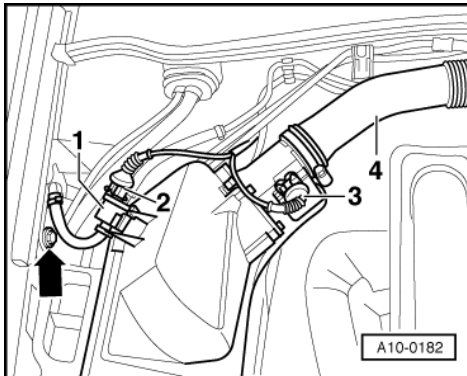
- -> Unclip green connector -arrow- for air conditioner magnetic clutch on lock carrier (bottom). Unplug connector and move wiring clear.

All models

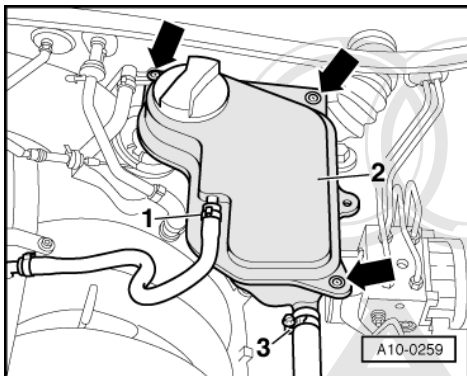
- Unbolt lock carrier and position it so that it cannot tilt over.



- -> Remove engine cover panels -arrows-.
- Remove cover above air cleaner housing.



- -> Unplug connectors -2- and -3- at air mass meter and ACF valve, and move wiring clear.
- Pull ACF valve -1- off air cleaner housing.
- Loosen bolt -arrow- and remove air cleaner housing together with air duct -4-.

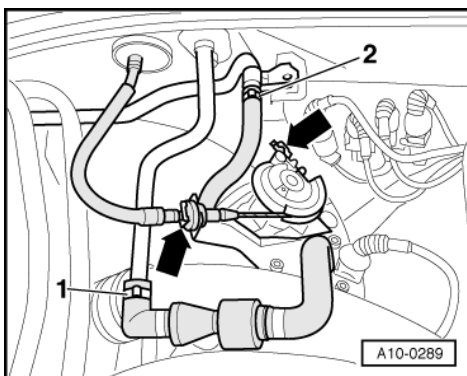


- -> Detach coolant hoses -1- and -3-.
- Unbolt coolant expansion tank -2- (-arrows-).
- Disconnect wire for coolant shortage indicator switch -F66 and move coolant expansion tank to one side.

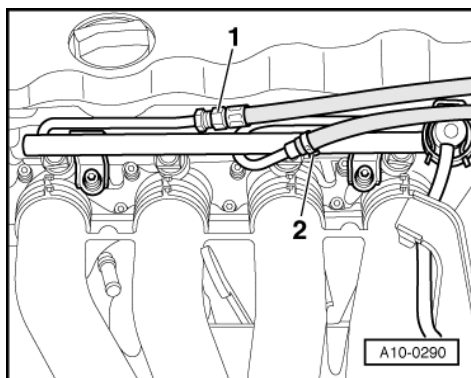
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Vehicles with cruise control system

- Disengage actuator rod at throttle valve control part.
- Pull vacuum hose off vacuum unit.



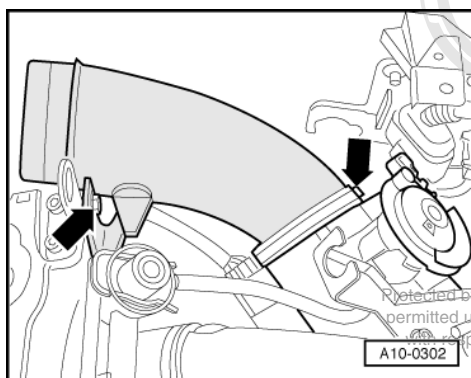
- -> Detach throttle cable at the throttle valve control part and at support bracket (do not remove throttle cable retainer). Move throttle cable clear to the side.
- Pull off vacuum hose -1- for brake servo.
- Pull off vacuum hose -2- for ACF valve.



- -> Disconnect fuel supply line -1- and fuel return line -2-.

Warning!

Fuel system is under pressure! Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

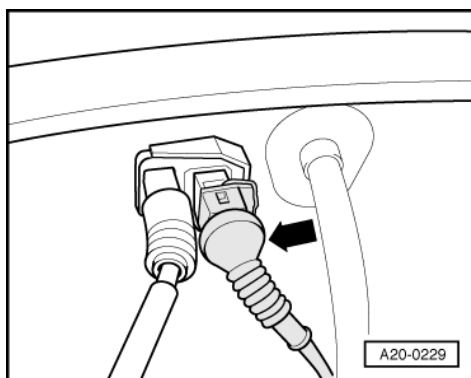


- -> Remove air intake pipe -arrows-.

Note:

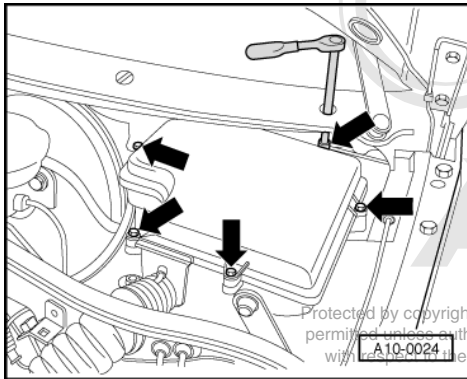
Detach hoses under air intake pipe after removing pipe.

Vehicles with automatic gearbox

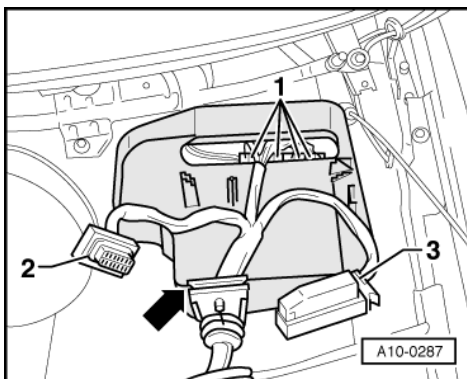


- -> Unplug connector at kickdown switch -arrow-.

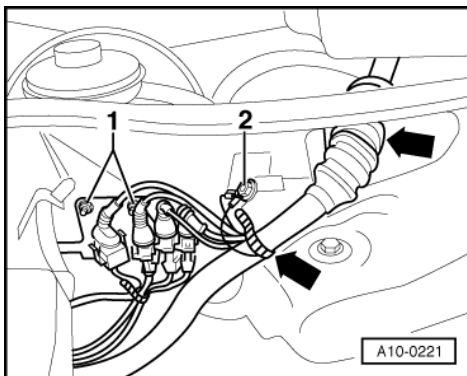
All models



- -> Remove cover for electronics box in plenum chamber -arrows-.



- Unclip retainer for engine control unit.
- -> Detach engine control unit, release connectors -2- and -3- and disconnect from control unit.
- Unplug connectors -1-.
- Disengage wiring harness -arrow- and move clear to one side.



- -> Unscrew earth connection and bracket for connectors -arrows-.
- Move wiring clear and place it on the engine.
- Disconnect left coolant hose (going to heat exchanger) at bottom coolant pipe on engine.
- Disconnect right coolant hose (going to heat exchanger) at pipe connection on cylinder head. To do this, disengage retaining clip on connecting flange.
- Unplug connector from speedometer sender -G22- on left of gearbox, and move wire clear.

Vehicles with manual gearbox:

- Unplug connector for reversing light switch on gearbox and move wiring clear.

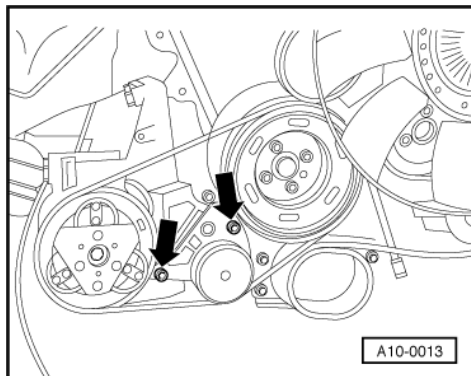


All models

Note:

Before removing the ribbed belt, mark the direction of rotation with chalk or a felt pen. If a used belt rotates in the wrong direction when refitted, it can break. When installing the belt, ensure it is correctly seated on the pulleys.

Vehicles with air conditioner:

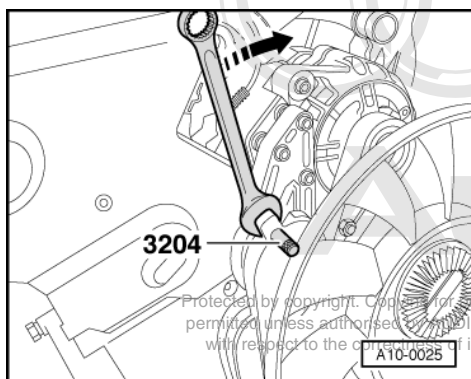


- -> Loosen retaining bolts on tensioning roller for ribbed belt for A/C compressor -arrows-, slacken belt and remove.
- Detach A/C compressor from bracket and secure to body with wire.

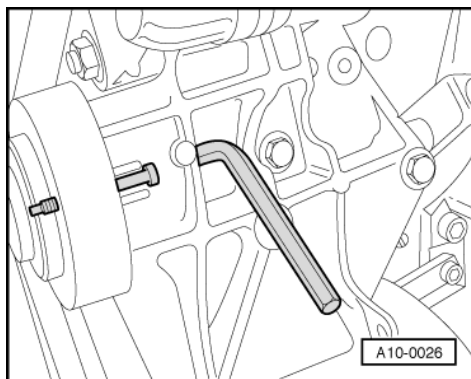
Caution

The air conditioner refrigerant circuit must not be opened.

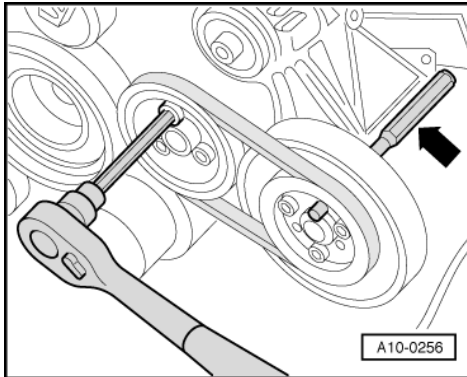
All models



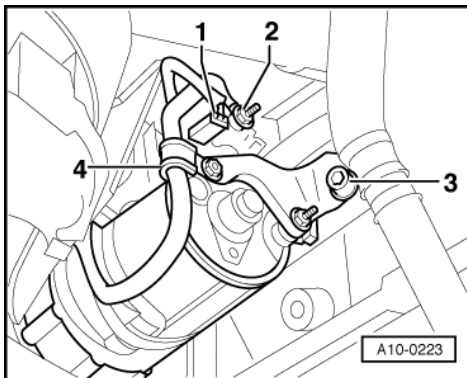
- -> To slacken ribbed belt, turn belt tensioner in direction of arrow.
- Secure belt tensioner in position with pin 3204.
- Remove ribbed belt from alternator pulley.
- Remove pin 3204.



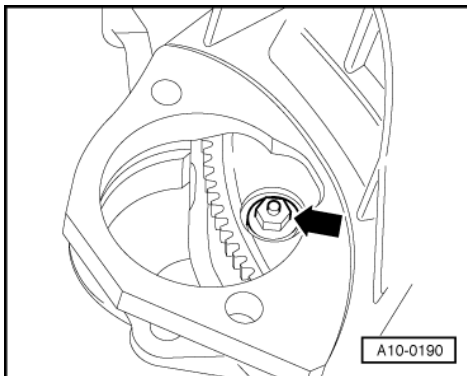
- -> Secure viscous fan pulley in position with an M5 x 60 mm bolt.
- Remove pulley and viscous fan using an 8 mm Allen key.
- Remove ribbed belt.



- -> Unbolt coolant pump pulley. To prevent pulleys from turning, insert a pin -arrow- in the vane pump pulley.
- Remove V-belt.
- Detach pulley from power steering pump.
- Unbolt vane pump for power steering, move clear to one side and tie in place. Do not open hydraulic connections.
- Unscrew bolts accessible from above securing front exhaust pipe to exhaust manifold.



- Unbolt heat shield from right engine support and lift up heat shield.
- Unscrew nuts on left and right engine mounts (top).
- -> Detach wires -1- and -2- from starter; remove insulator from positive connection on starter.
- Unbolt cable clamp -4-.
- Unbolt bracket -3- from cylinder block.
- Unbolt starter from gearbox and remove.



- Unbolt earth wire from engine support (right side).



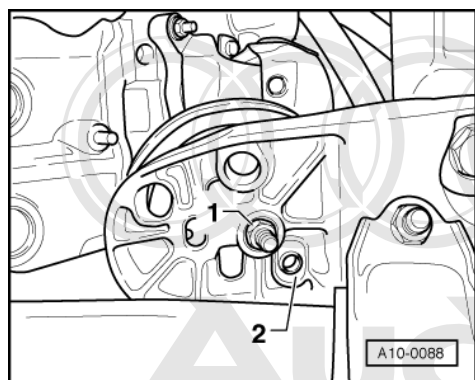
Vehicles with automatic gearbox

- -> Unscrew 3 torque converter nuts through starter opening using Matra V175 15 mm A/F socket attachment (turn crankshaft 1/3 turn each time).

Note:

To prevent engine from turning when loosening torque converter nuts, counterhold central bolt on vibration damper.

All models



- -> Mark positions of mountings -1- and locating sleeves -2- on left and right engine mounts (bottom).

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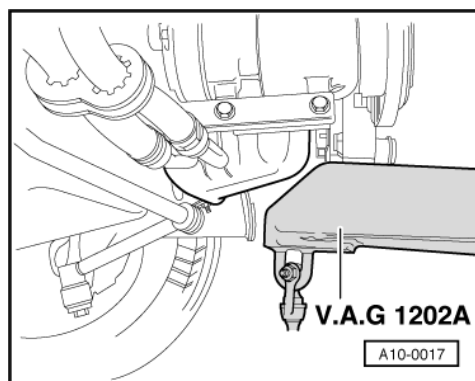
Different mounting holes are provided for the different engine versions.

- Slacken nuts -1- several turns.
- Unscrew bolts accessible from below securing front exhaust pipe to exhaust manifold.
- Pull front exhaust pipe with catalytic converter off exhaust manifold.

Note:

The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° otherwise it can be damaged.

- Place front exhaust pipe with catalytic converter on heat shield for drive shaft.



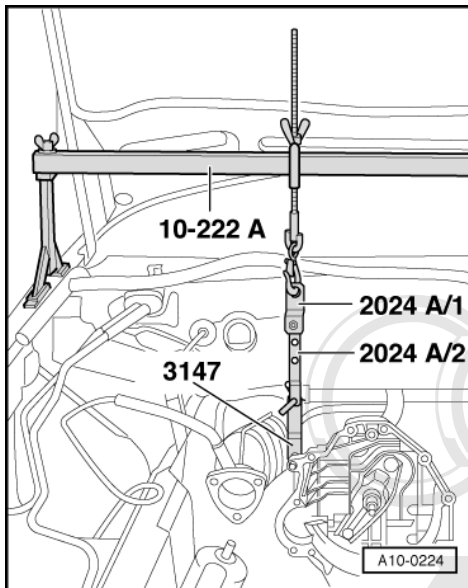
- -> Lift engine and gearbox slightly with workshop crane V.A.G 1202 A.

Warning

Ensure that components are supported safely - accident risk.

- Unscrew engine/gearbox securing bolts accessible from below

- Lower engine back down again.



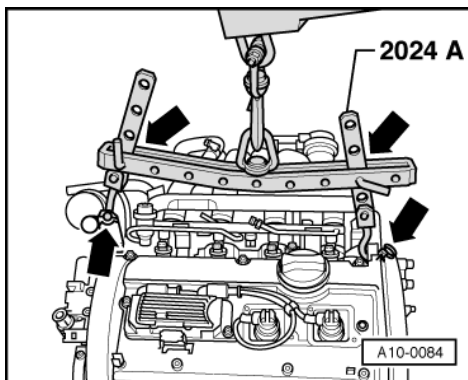
- -> Set up engine support bracket 10-222 A on bolted flanges of wing panels with spindle at front.
- Engage gearbox support 3147 in bolt hole in bell housing on gearbox.
- Connect gearbox support 3147 to support bar 10-222 A using extension 2024 A/1 and bar 2024 A/2 (secure bolt with nut and washer).

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Note:

Shown in illustration with engine removed.

- Unscrew upper engine/gearbox securing bolts. Leave one one bolt in place (hand-tight).



- -> Attach lifting tackle 2024 A to engine and hook onto workshop crane 1202 A.

Note:

To balance the centre of gravity of the engine, position the hook attachments as shown in the illustration.

Warning

The hook attachments and locating pins on the lifting tackle must be secured with locking pins (arrows in illustration).

- Remove the last securing bolt.



Note:

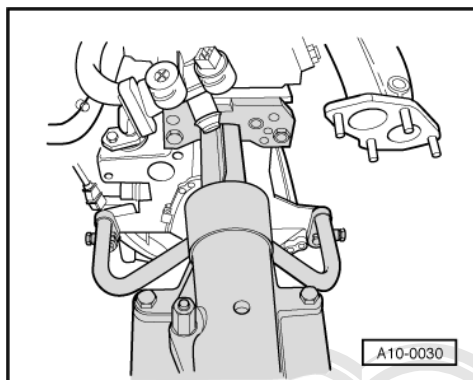
Check that all hoses and other connections between engine and body have been detached.

- Lift engine over studs of engine mounts.
- Tighten spindle of support bar 10-222 A.
- Guide engine out of engine compartment from the front.

Vehicles with automatic gearbox

- Secure torque converter in gearbox to prevent it falling out.

1.3 - Attaching engine to engine stand



-> When working on the engine, secure it to the engine stand using engine bracket VW 540.

1.4 - Installing

Installation is carried out in the reverse order, when doing this note the following:

Notes:

- ♦ When performing repairs, renew seals, gaskets, self-locking nuts and bolts which have a specified tightening angle.
- ♦ Secure all hose connections with the correct hose clips (same as original equipment)

=> Parts catalogue

- Check whether the dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- Fit intermediate plate onto dowel sleeves.

Vehicles with manual gearbox

- Check clutch release bearing for wear and renew if necessary.
- Lightly grease splines on gearbox input shaft with G 000 100. Do not grease guide sleeve for release bearing.
- Check that clutch plate is properly centred in vehicles with manual gearbox.
- A needle bearing must be fitted in the crankshaft on vehicles with manual gearbox. Install needle bearing if necessary => Page 71 .

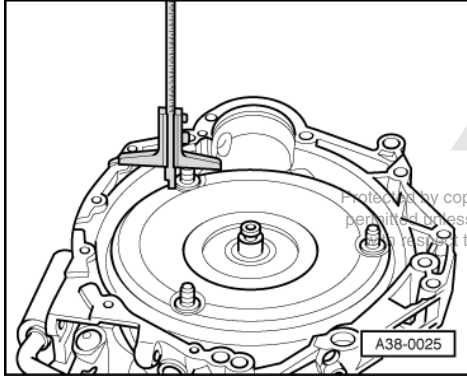
Vehicles with automatic gearbox

- In vehicles with automatic gearbox, no needle bearing must be fitted in the crankshaft. Remove needle bearing if necessary => Page 71 .

- To secure the torque converter on the drive plate only use the correct nuts as specified in the parts catalogue.

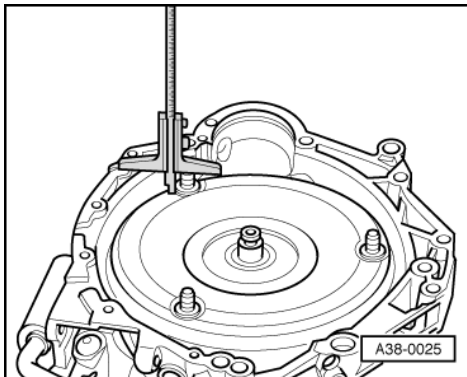
=> Parts catalogue

- Tighten torque converter nuts with Matra V175 15 mm A/F socket attachment.
- Before installing engine, rotate torque converter and drive plate so that one hole and one stud are level with the aperture for the starter motor.



Checking position of torque converter

-> If the torque converter has been installed correctly, the distance between the joint surface on the torque converter bellhousing and the bottom contact surface on the torque converter studs should be approx 24.5 mm (automatic gearbox 01N).



-> If the torque converter has not been fully inserted, this distance will be approx. 13 mm.

Important

If the torque converter is not installed correctly, the torque converter drive plate or the ATF pump will be seriously damaged when the gearbox is joined to the engine.

- Check ATF level:

=> Automatic gearbox 01N; Repair group 37; Checking and changing ATF; Checking ATF level and topping up ATF

All models

- Ensure that engine mounts are free of stress by shaking engine to align it before tightening engine mounts.
- Install A/C compressor and power steering pump.
- Install ribbed belt =>Page 37 .
- Install lock carrier =>Page 19 .



- Fill up with coolant=> Page 159 .

Notes:

- ♦ Drained-off coolant may only be used again if the original cylinder head or cylinder block are re-installed.
- ♦ Coolant must not be used again if it is dirty.

- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 25 Nm.
- Adjust throttle cable => Page 222
- Stress-free alignment of exhaust system => Page 238 .
- Electrical connections and routing of wiring:

=> Current flow diagrams, Electrical fault-finding and Fitting locations

- After connecting battery terminals, program in the radio anti-theft code.

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch function.
- Set clock to correct time.
- Check oil level before starting engine.
- Perform adaptation of throttle valve control part:

=> Motronic injection and ignition system (4-cylinder); Repair group 24; Testing throttle valve control part -J338; Performing basic setting of throttle valve control part -J338 Testing throttle valve control part -J338 Performing basic setting of throttle valve control part -J338

=> Motronic injection and ignition system (4-cylinder 07.96 ä); Repair group 24; Testing throttle valve control part; Adapting throttle valve control part to engine control unit Testing throttle valve control part Adapting throttle valve control part to engine control unit

- Interrogate fault memory:

=> Motronic injection and ignition system (4-cylinder); Repair group 01; Self-diagnosis of Motronic system; Interrogating and erasing fault memory Self-diagnosis of Motronic system Interrogating and erasing fault memory

=> Motronic injection and ignition system (4-cylinder 07.96 ä); Repair group 01; Self-diagnosis; Interrogating and erasing fault memory Self-diagnosis Interrogating and erasing fault memory

Note:

Faults will have been stored in the memory because connectors have been unplugged. Therefore interrogate and erase fault memory after installing engine.

- Adjust headlight settings:

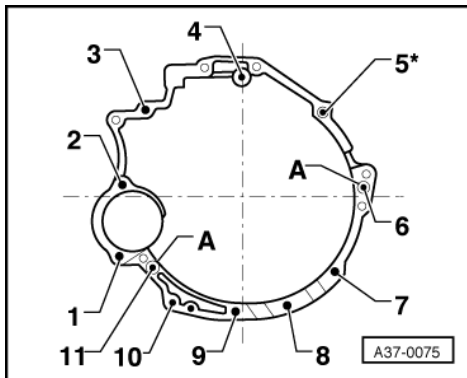
=> Electrical system; Repair Group 94; Removing/ installing and servicing headlights; Adjusting headlights Removing/ installing and servicing headlights Adjusting headlights

1.5 - Tightening torques

Notes:

- ♦ The tightening torques listed on this page apply only to lightly greased, oiled, phosphated, or black-finished nuts and bolts.
- ♦ Additional lubricant such as engine or gearbox oil may be used, but do not use graphite lubricant.
- ♦ Do not use degreased parts.

- ♦ Tolerance for tightening torques is $\pm 15\%$.

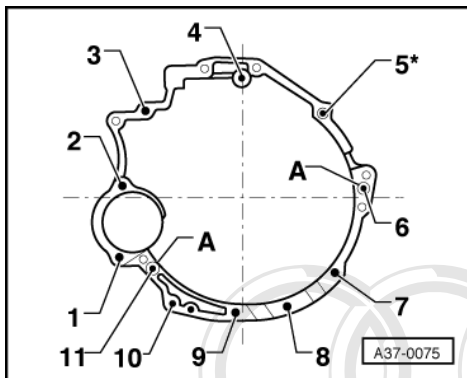


-> Engine/gearbox mountings (manual gearbox)

Item No.	Bolt	Nm
1, 3, 4	M12 x 67	65
2, 6	M12 x 90	65
5, 11	M12 x 110	65
7, 8 1), 9, 10	M10 x 45	45

- 1) M8 bolt fitted up to approx. 07.96: tightening torque 25 Nm

A: centering sleeves



-> Engine/gearbox mountings (automatics)

Item No.	Bolt	Nm
1, 2, 3, 4, 11	M12 x 67	65
5, 6	M12 x 90	65
7, 8, 9, 10	M10 x 45	45

A: centering sleeves

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Component		Nm
Bolts/nuts	M6	10
	M8	20
	M10	45
	M12	65
Except for the following:		



Component	Nm
Engine mount to subframe	25
Engine support to engine mount	25
Torque reaction support stop to torque reaction support and lock carrier	25

Component	Nm
Drive plate to torque converter M10 x1	85
A/C compressor to bracket	25
Power steering pump to bracket	25
Belt pulley to power steering pump	25
Viscous fan to fan bearing	45
Drain plug to coolant pump	30
Belt pulley to coolant pump	25
Front exhaust pipe to exhaust manifold	30
Brackets for ATF pipes	10

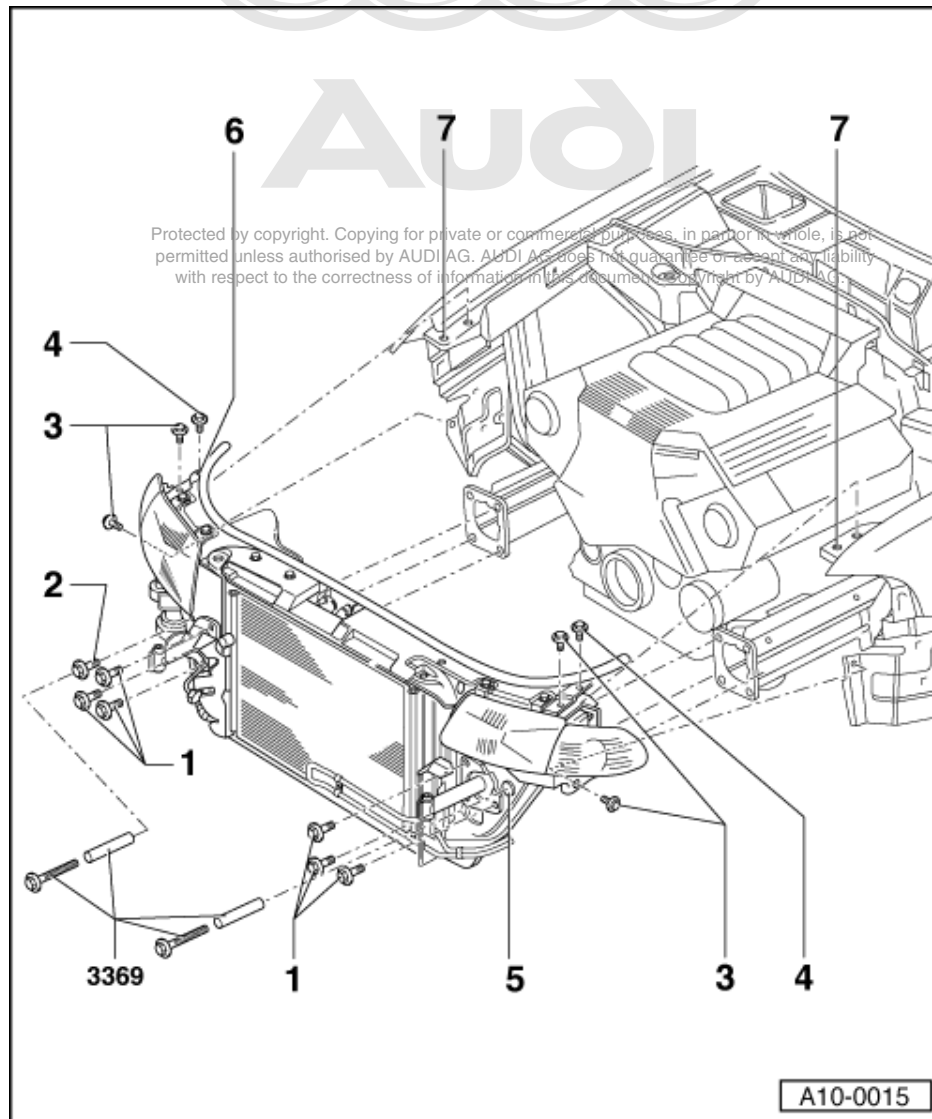


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13 - Crankshaft group

1 - Dismantling and assembling engine

1.1 - Dismantling and assembling engine



1.2 - Lock carrier: moving into service position

Special tools, testers and other equipment required

- ♦ Special tool 3369

- 1 45 Nm
- 2 45 Nm
- 3 10 Nm
- 4 10 Nm

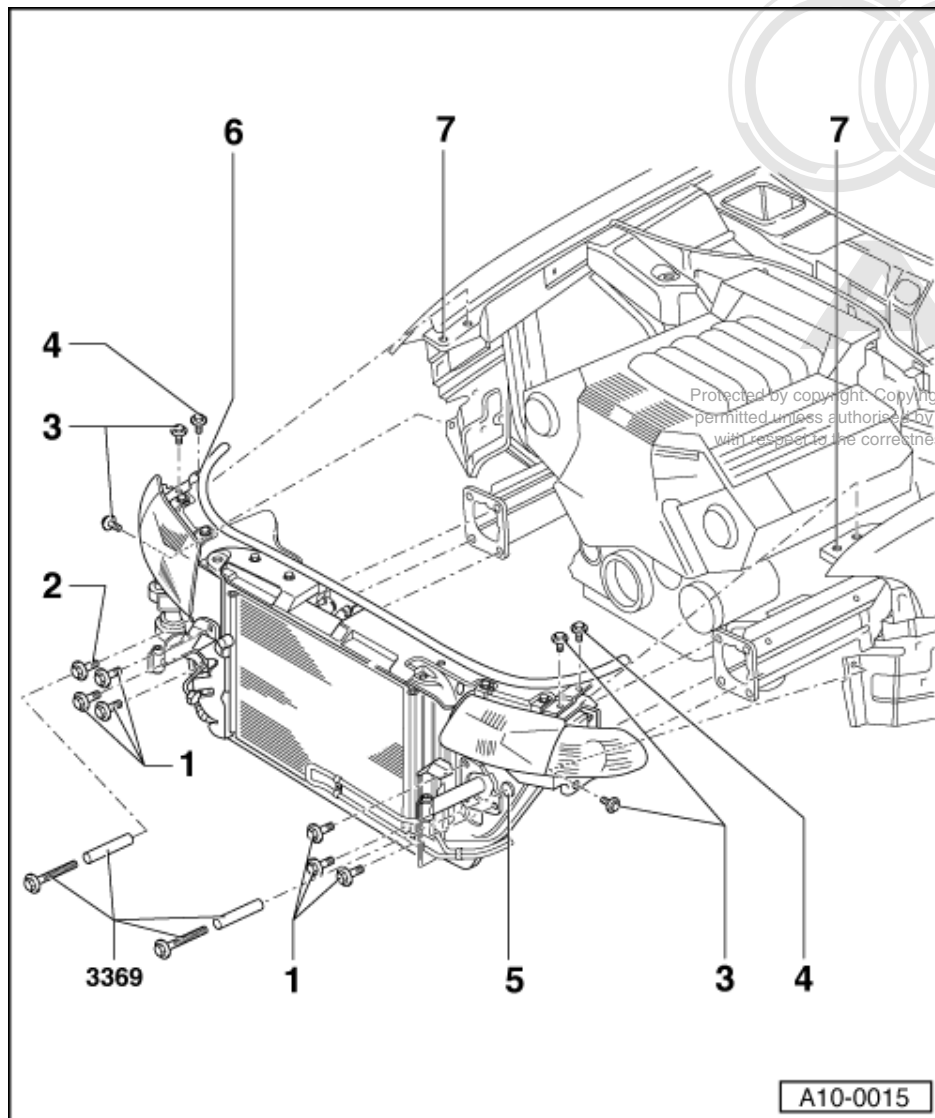


5 Hole

- ♦ For special tool 3369

6 Hole in lock carrier

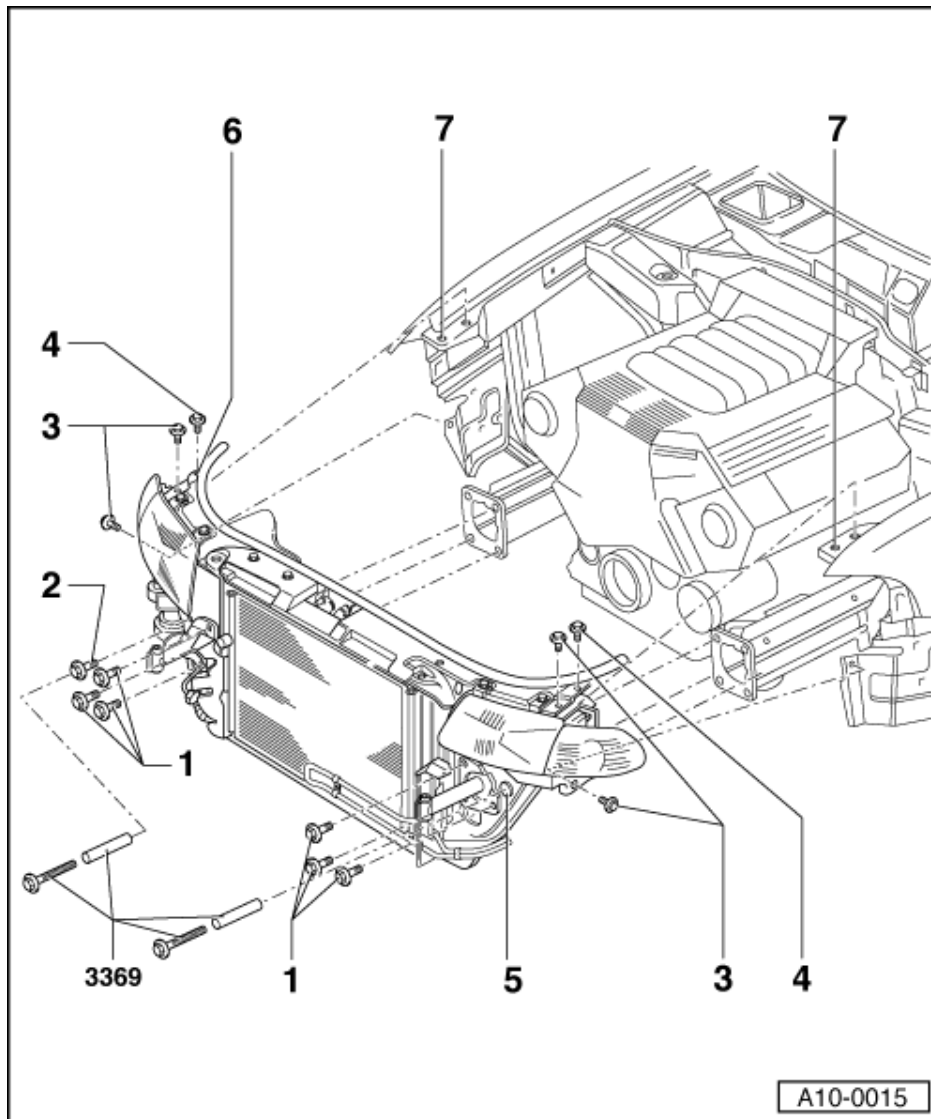
7 Hole in wing panel



- Remove front bumper.

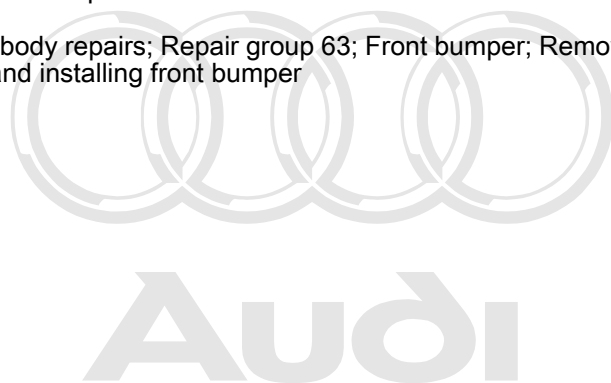
=> General body repairs; Repair group 63; Front bumper; Removing and installing front bumper Front bumper
Removing and installing front bumper

- Undo the 3 quick-release fasteners on the noise insulation at the front.
- Unbolt air duct between lock carrier and air cleaner (air duct is bolted to lock carrier).
- Remove retainer clips (if fitted) for wiring harness to the left of the radiator cowl.
- Remove bolt -2- on the right and screw in special tool 3369.
- Screw special tool 3369 into hole -5- (left).



- Remove bolts -1- and -3-.
- Remove bolts -4- and pull the whole lock carrier out as far as it will go.
- Secure the lock carrier with suitable M6 bolts in hole -6- (lock carrier) and hole -7- (wing panel).
- When lock carrier has been installed, check that the wiring next to the radiator is correctly routed.
- Install front bumper.

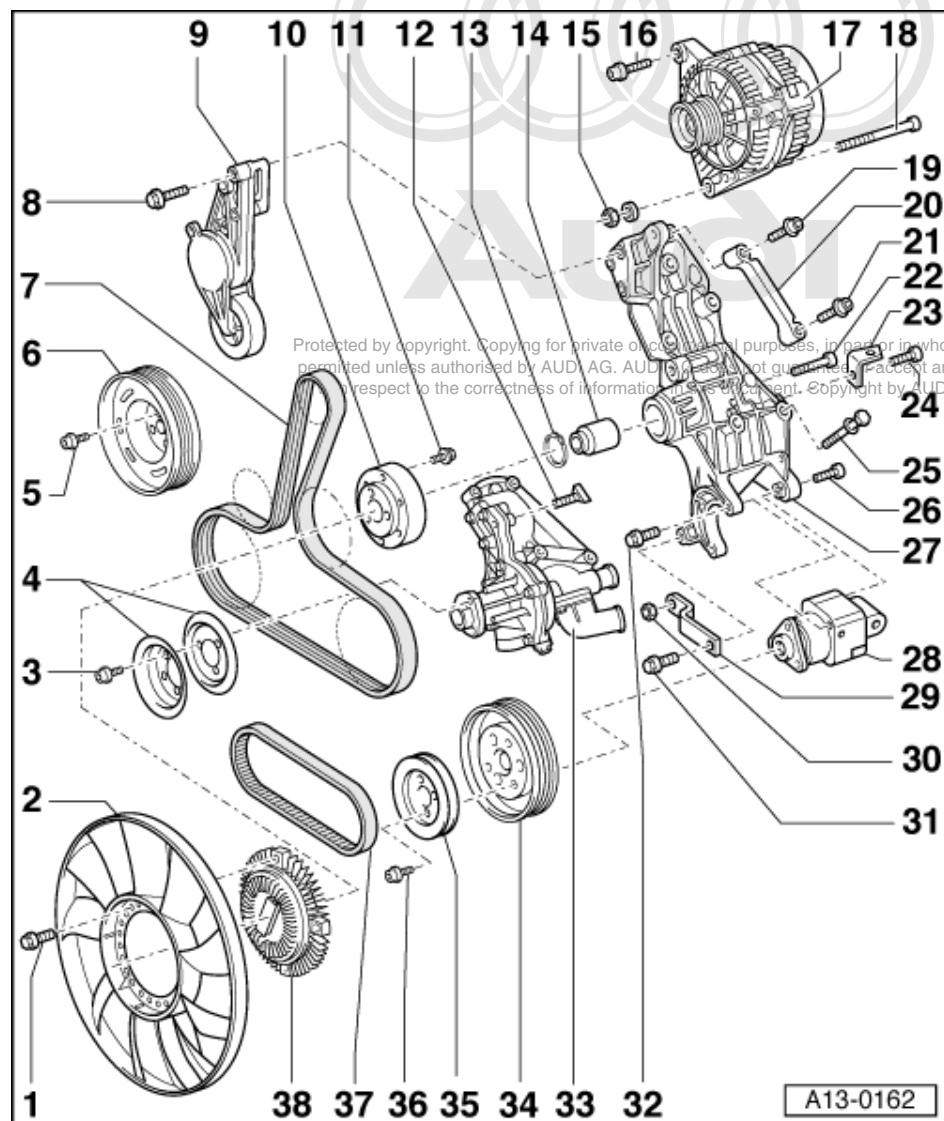
=> General body repairs; Repair group 63; Front bumper; Removing and installing front bumper
Removing and installing front bumper



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1.3 - Ribbed belt drive for vane pump, alternator and viscous fan; V-belt drive for coolant pump



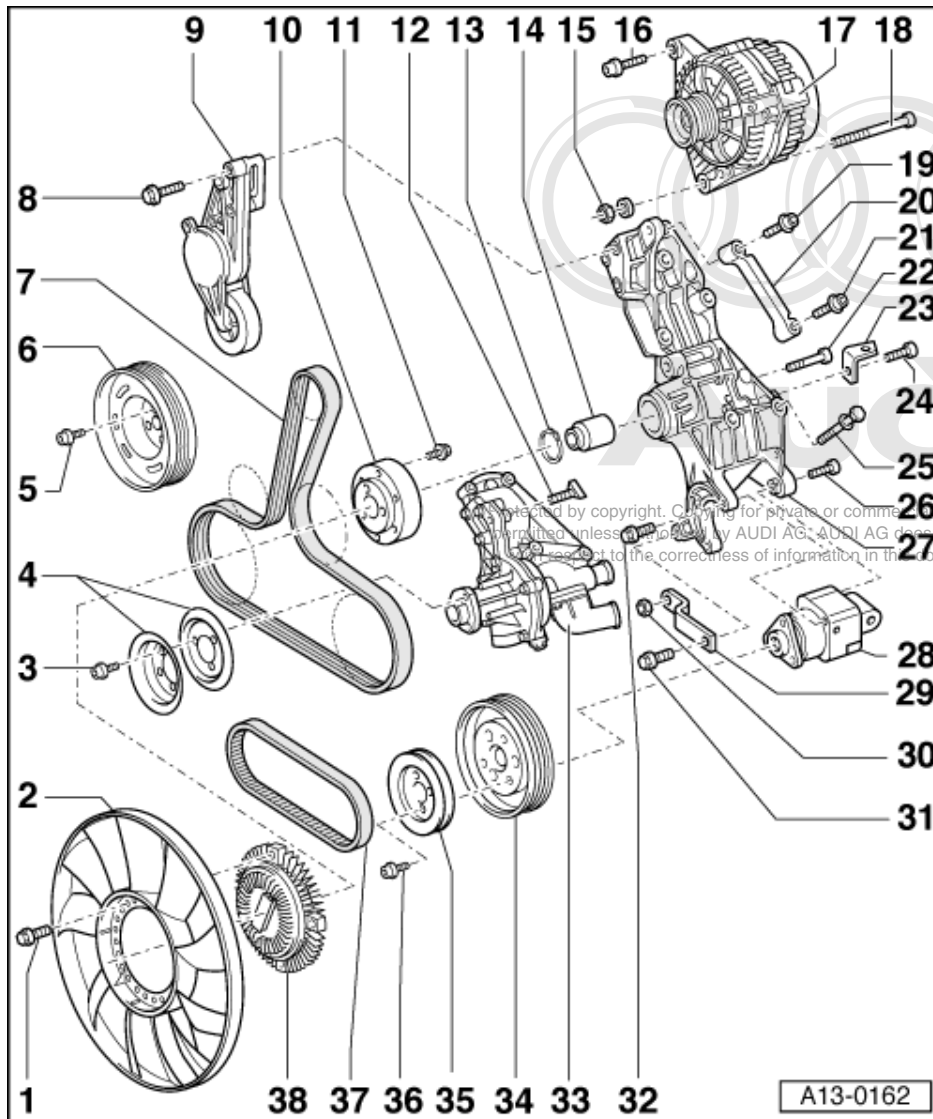
Note:

Before removing the ribbed belt, mark the direction of rotation with chalk or a felt pen. If a used belt rotates in the wrong direction when refitted, it can break. When installing the belt, ensure it is correctly seated on the pulleys.

1 10 Nm

2 Fan wheel

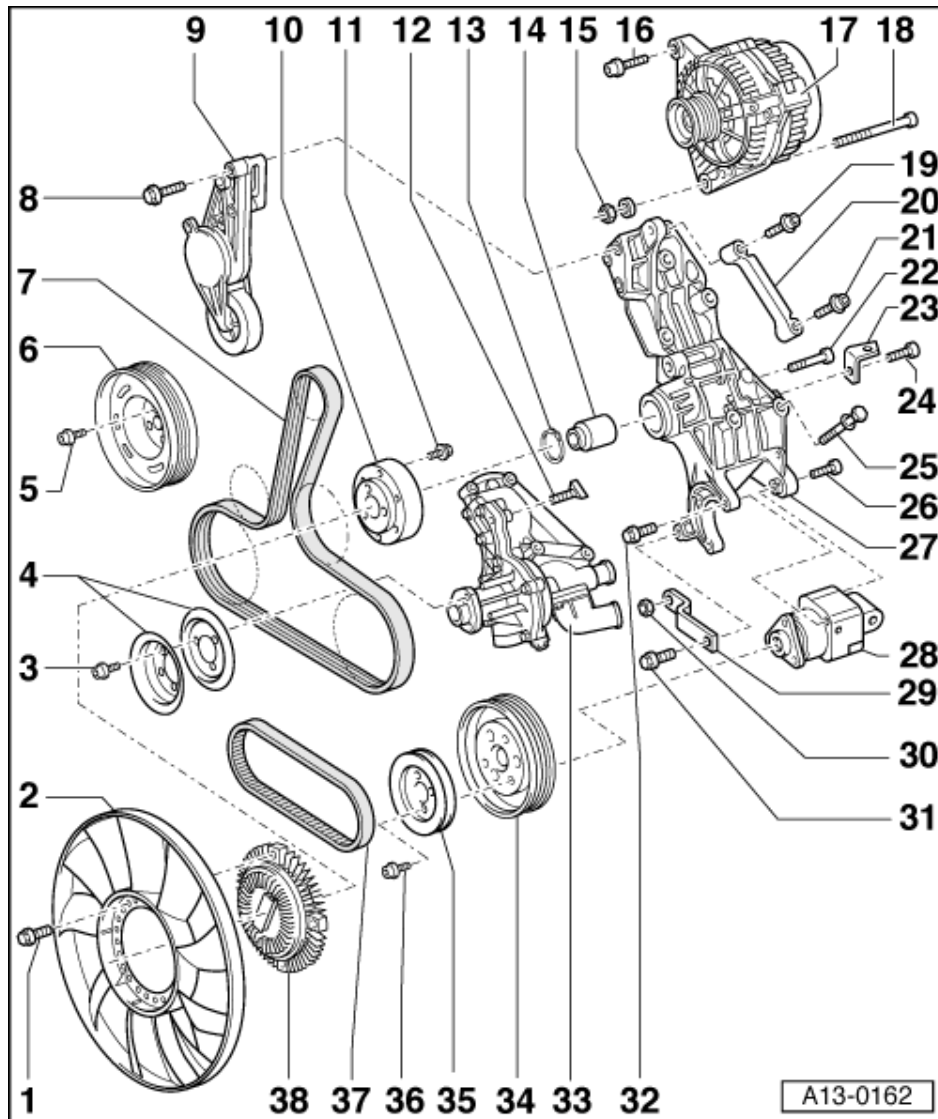
- ♦ For viscous fan
- ♦ Removing and installing => Fig. 35



- 3 25 Nm
 4 Pulley
 ♦ For coolant pump
 ♦ V-belt version
 ♦ Position: flat section of pulley goes towards coolant pump
 5 Bolt (special type)
 ♦ Tighten to 40 Nm
 ♦ Use only correct bolts (same as original equipment); strength rating 10.9

=> Parts catalogue

- 6 Vibration damper
 ♦ With pulley for ribbed belt
 ♦ Can only be installed in one position
 => Fig 35

**7 Ribbed belt**

- ♦ Removing and installing
=> Page 35
- ♦ Check for wear

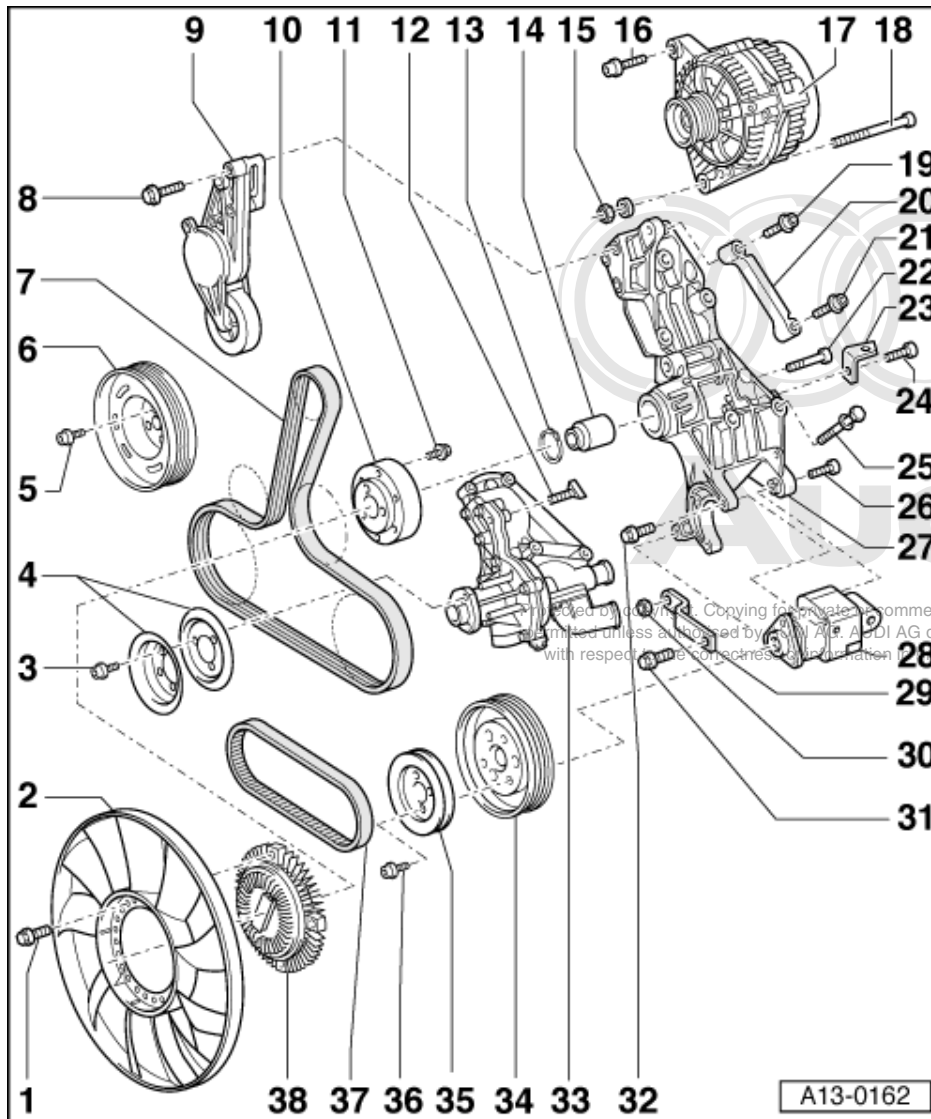
8 25 Nm**9 Tensioning element for ribbed belt**

- ♦ Turn with open-end spanner to slacken ribbed belt => Page 36
- ♦ Hold in position by inserting angled Allen key or pin 3204 in fixing holes

10 Pulley

- ♦ For viscous fan
- ♦ Removing and installing => Fig. 35

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11 10 Nm

12 Hammer head bolt

- ♦ Insert before installing bracket for alternator, vane pump and viscous fan

13 Circlip

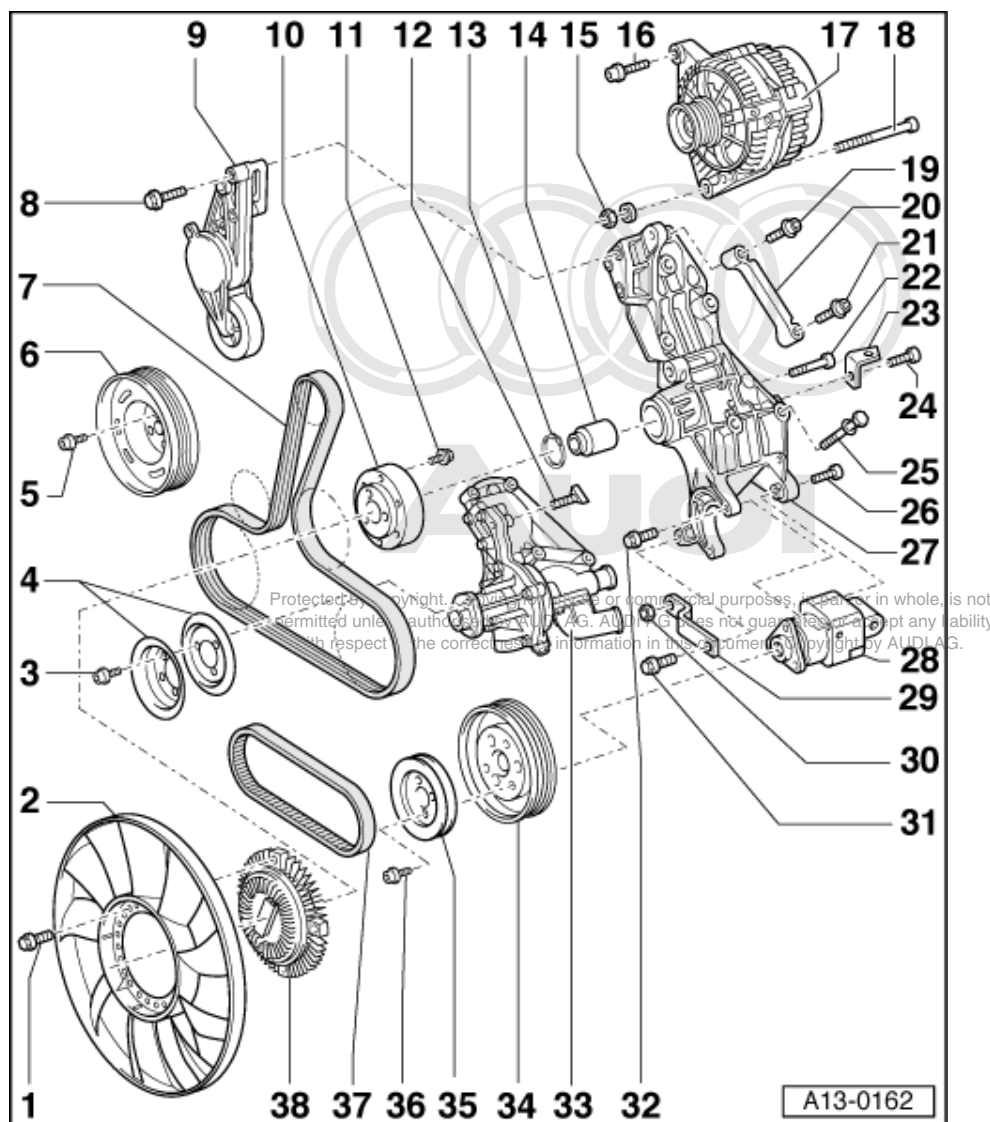
- ♦ For viscous fan bearing
- ♦ Removing and installing
=> Page 39

14 Bearing

- ♦ For viscous fan
- ♦ Removing and installing
=> Page 39

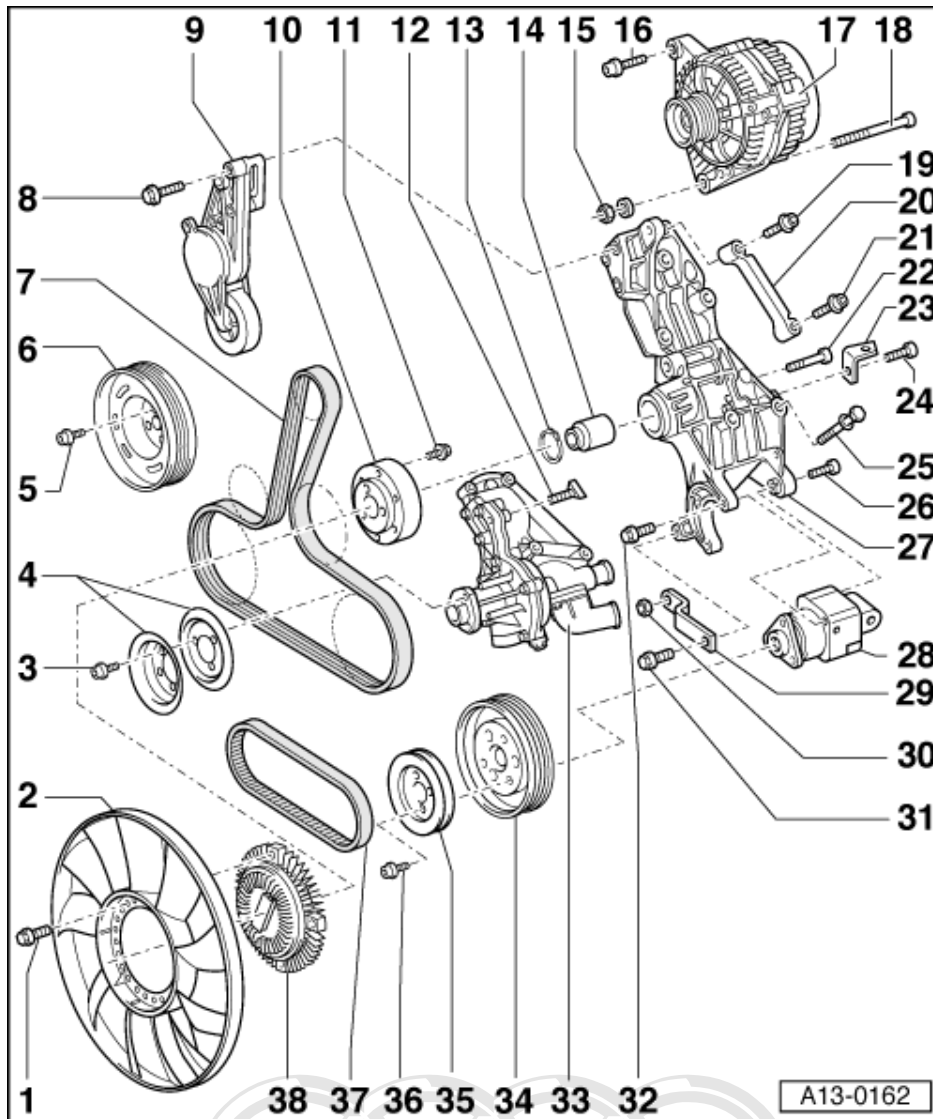
15 40 Nm

16 25 Nm

**17 Alternator**

- ◆ Removing:
 - Disconnect battery earth strap
 - Slacken ribbed belt and take belt off alternator => Page 35 .
 - Slacken mountings, top and bottom
 - Pivot alternator slightly to one side and pull out bottom bolt
 - Disconnect wiring from alternator and move wiring clear
 - Remove alternator
- ◆ To facilitate the positioning of alternator on bracket, knock back bush for bottom retaining bolt slightly

18 40 Nm



19 40 Nm

20 Strut

- ♦ Mounted on cylinder block

21 25 Nm

22 45 Nm

- ♦ Removing and installing pulley with viscous fan=>Fig. 35

23 Support

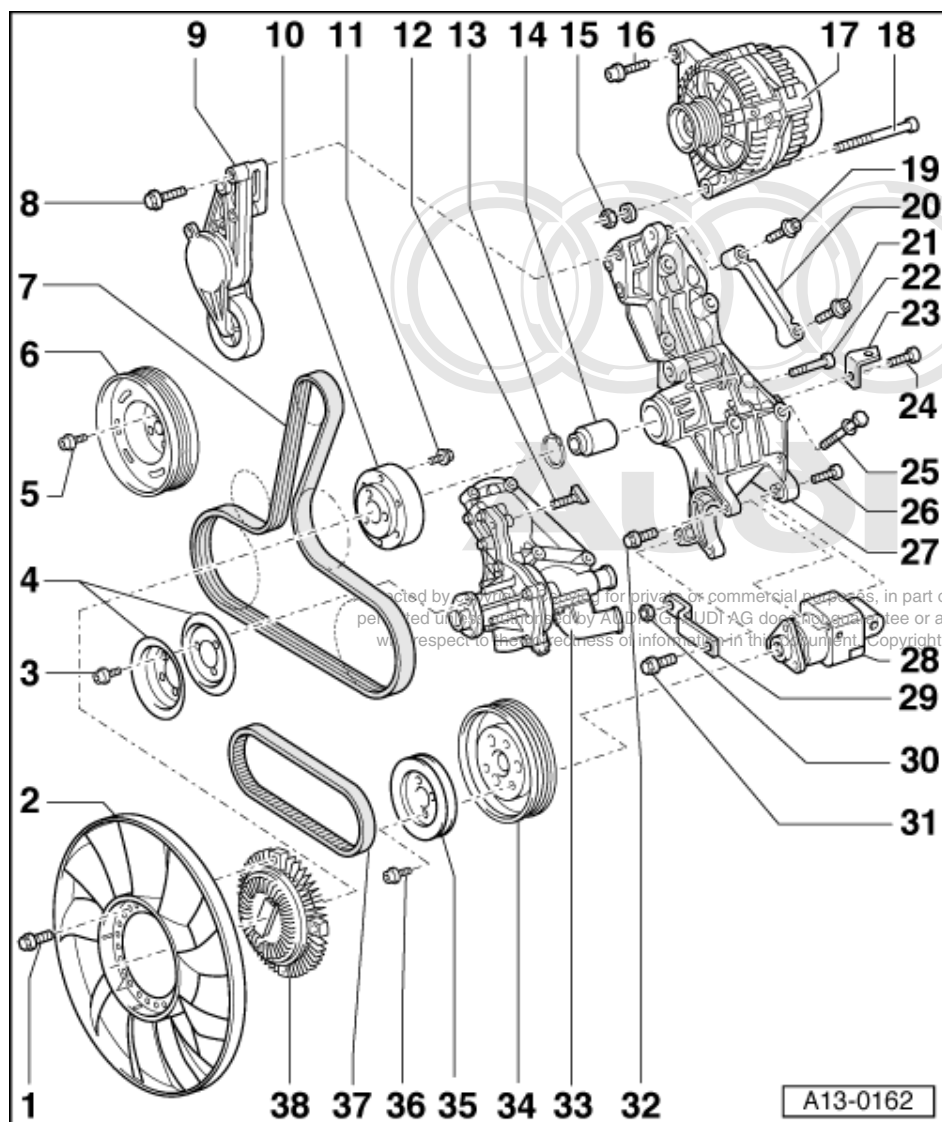
- ♦ For intake manifold

24 20 Nm

25 25 Nm

- ♦ Bolts have different lengths. For positions and tightening sequence => Page 165

26 25 Nm

**27 Bracket**

- ♦ For alternator, vane pump and viscous fan
- ♦ Removing and installing
=> Page 40

28 Vane pump

- ♦ For power steering
- ♦ Removing and installing:

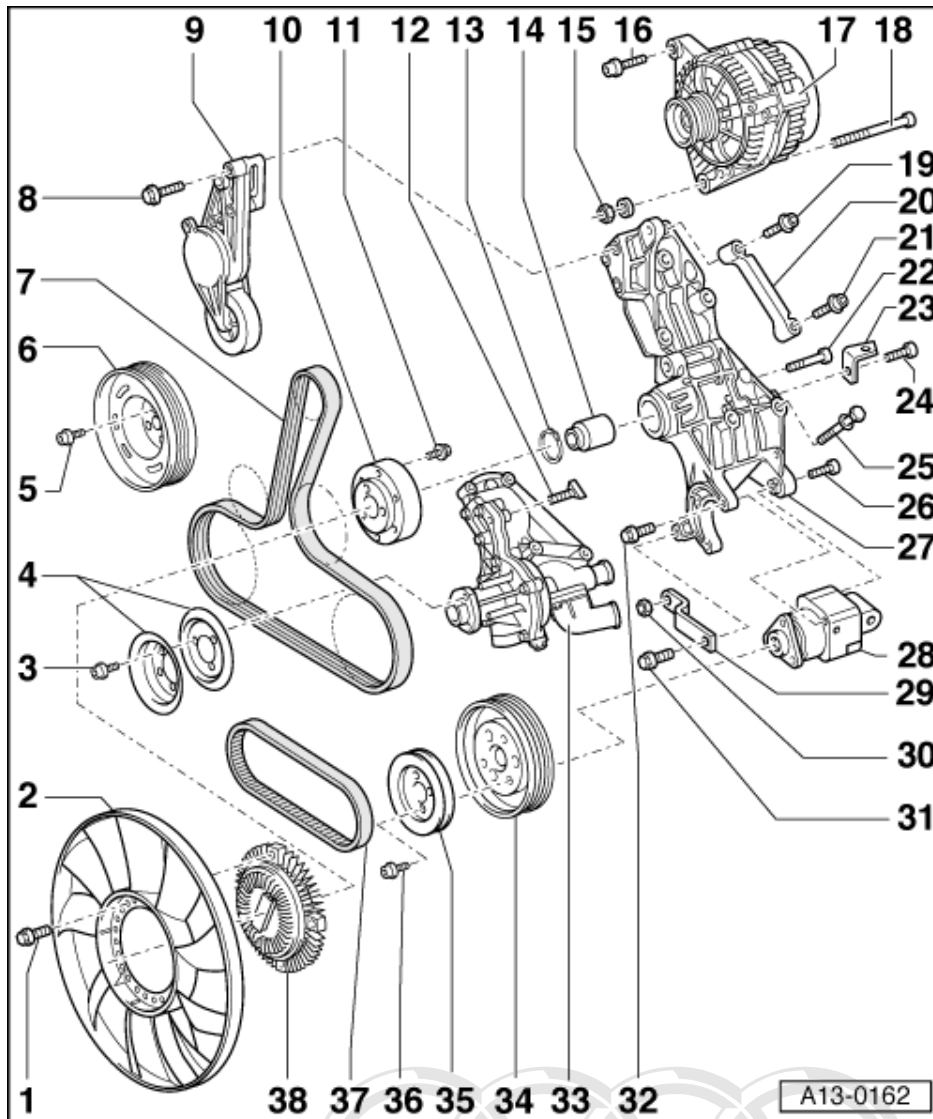
=> Running Gear, Front-wheel drive and Four-wheel drive; Repair Group 48; Power steering/hydraulic fluid circuit, 4-cylinder engine; Removing and installing vane pump Power steering/hydraulic fluid circuit, 4-cylinder engine Removing and installing vane pump

29 Bracket

30 25 Nm

31 20 Nm

32 25 Nm



33 Coolant pump

- ♦ With thermostat
- ♦ Removing and installing
=> Page 163

34 Pulley

- ♦ For vane pump
- ♦ Ribbed belt version
- ♦ Position: open side faces to front of vehicle

35 Pulley

- ♦ For vane pump
- ♦ V-belt version

36 25 Nm

37 V-belt

- ♦ For coolant pump
- ♦ Removing and installing
=> Page 38

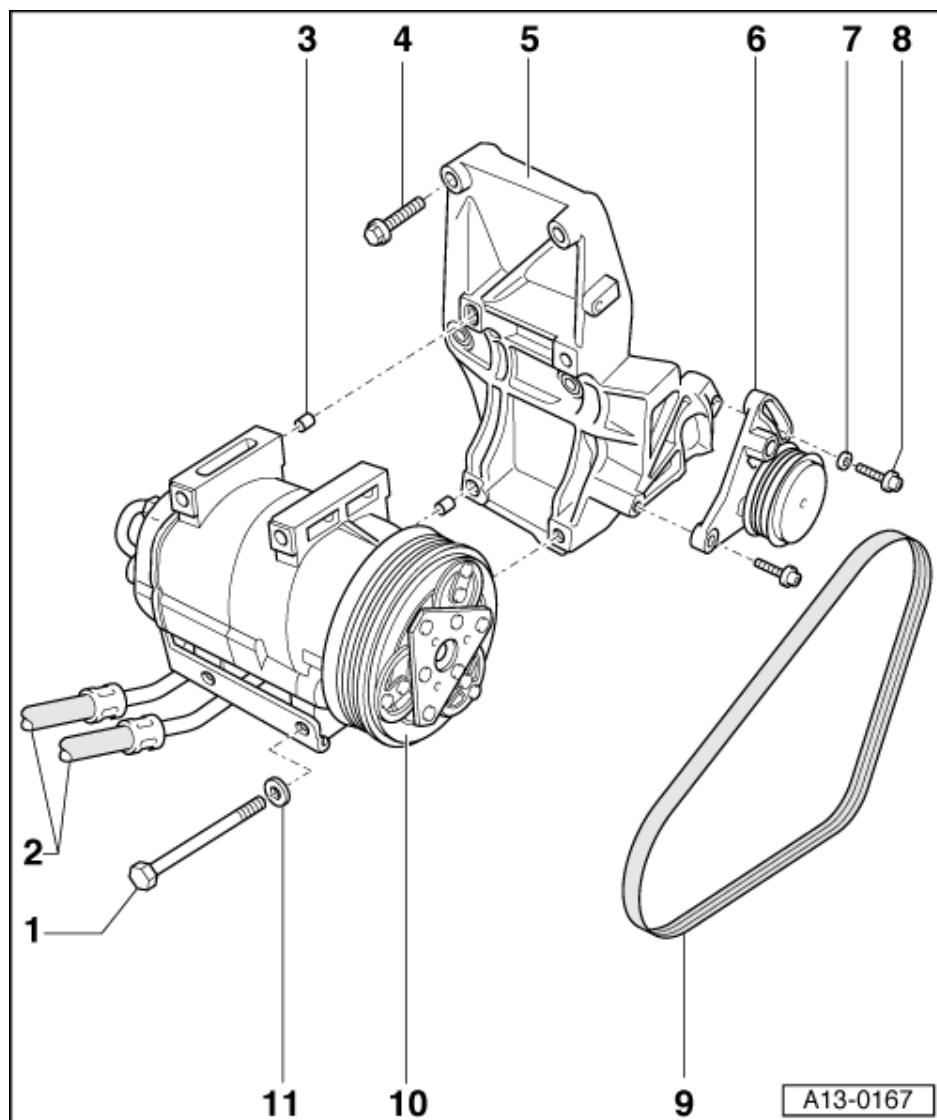
38 Viscous coupling

- ♦ Removing and installing => Fig. 35

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1.4 - Ribbed belt drive for air conditioner



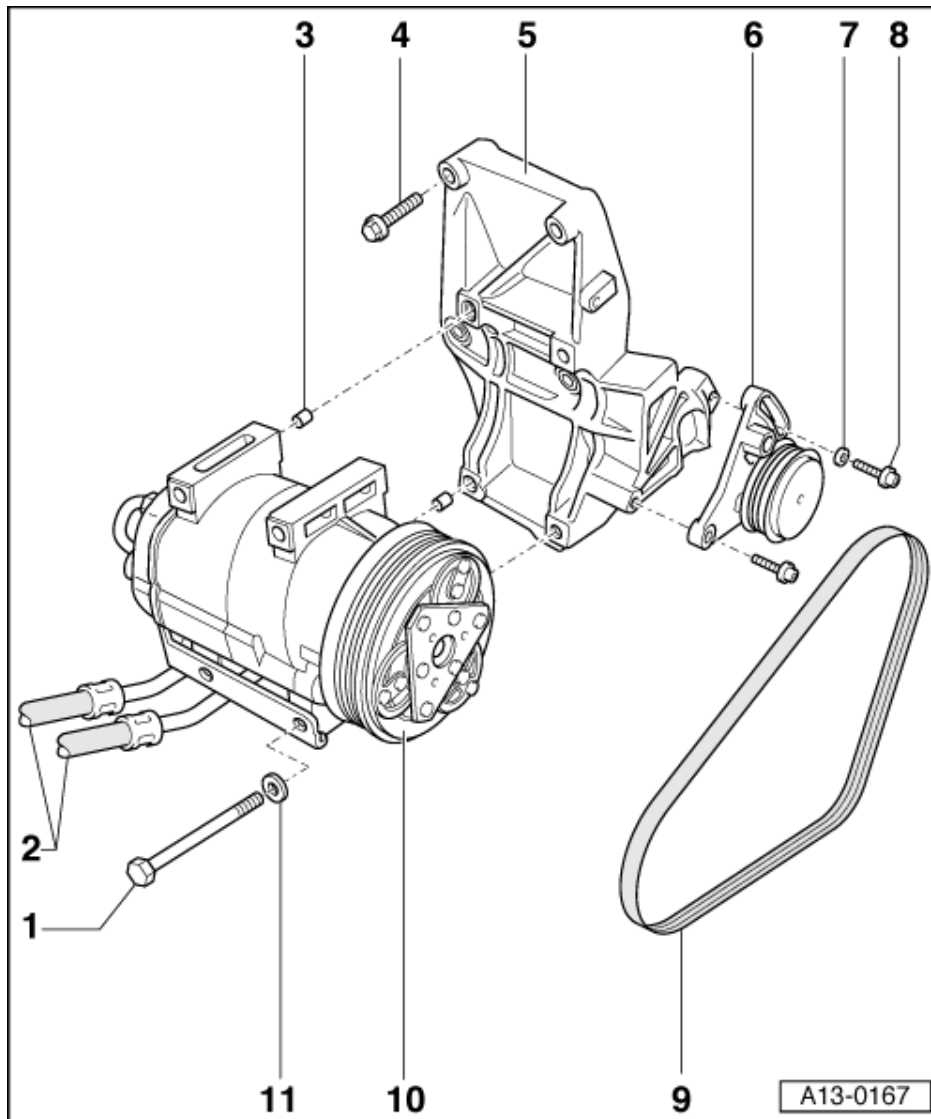
Important
Do not open the refrigerant circuit of the air conditioner.

Note:

Before removing the ribbed belt, mark the direction of rotation with chalk or a felt pen. If a used belt rotates in the wrong direction when refitted, it can break. When installing the belt, ensure it is correctly seated on the pulleys.

1 25 Nm

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2 Refrigerant pipes

- ♦ Do not unscrew or disconnect pipes

3 Dowel sleeve

- ♦ Check that sleeve is correctly seated in bracket

4 Bolt

- ♦ Bolt with strength rating 8.8: tighten to 25 Nm
- ♦ Bolt with strength rating 10.9: tighten to 30 Nm

=> Parts catalogue

5 Bracket

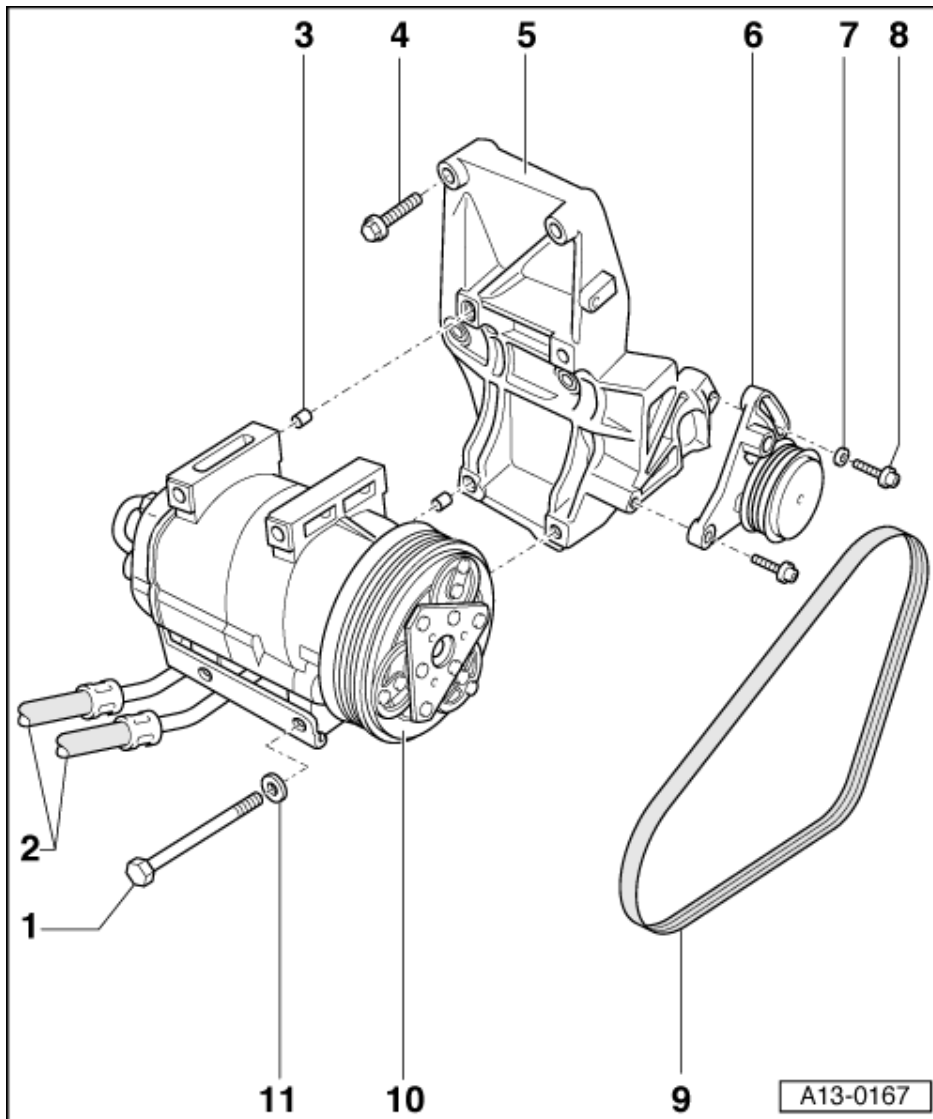
- ♦ For A/C compressor

6 Tensioning roller

- ♦ For ribbed belt
- ♦ Removing and installing ribbed belt => Page 36

7 Washer

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8 20 Nm

9 Ribbed belt

- ♦ Removing and installing
=> Page 35
- ♦ Check for wear

10 A/C compressor

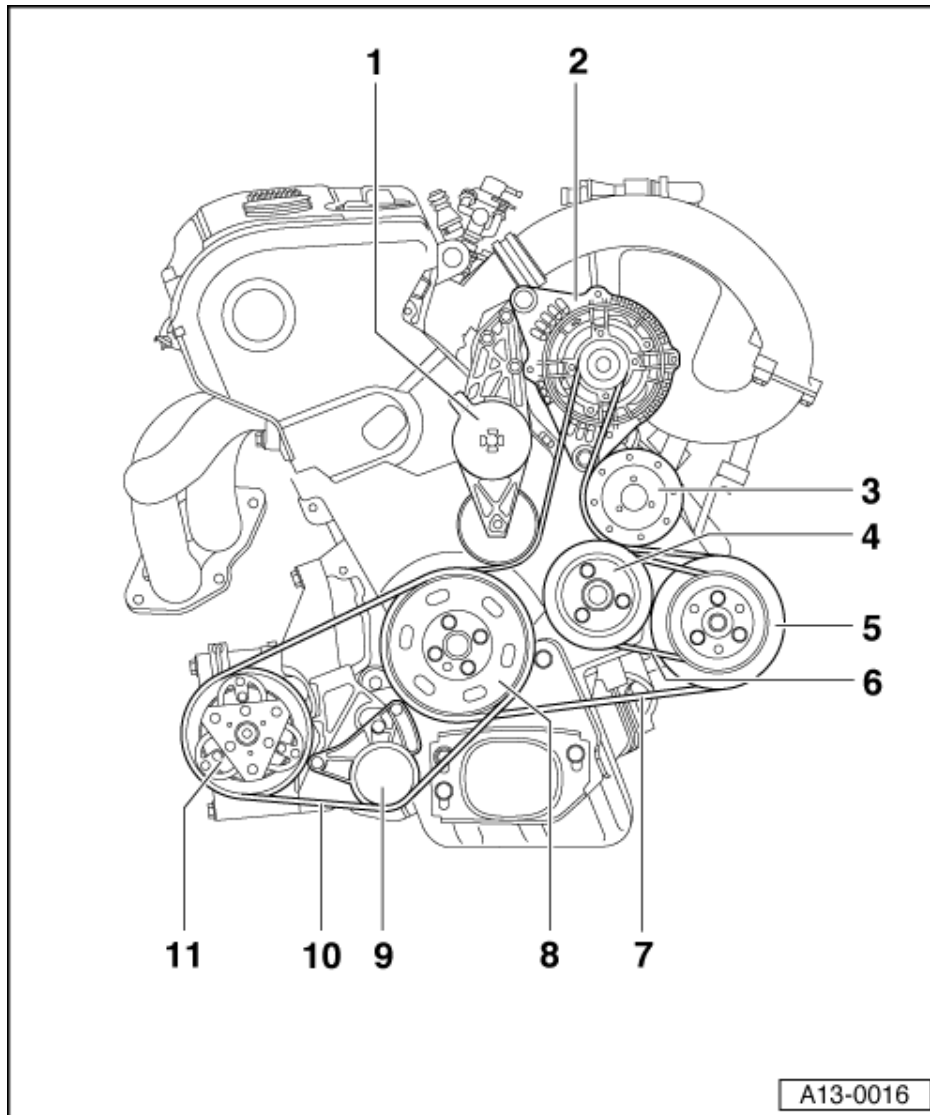
- ♦ After removing compressor from mountings, secure it to chassis side member with wire or similar Do not leave it suspended on refrigerant hoses.
- ♦ Do not unscrew or disconnect refrigerant hoses or pipes.

11 Washer



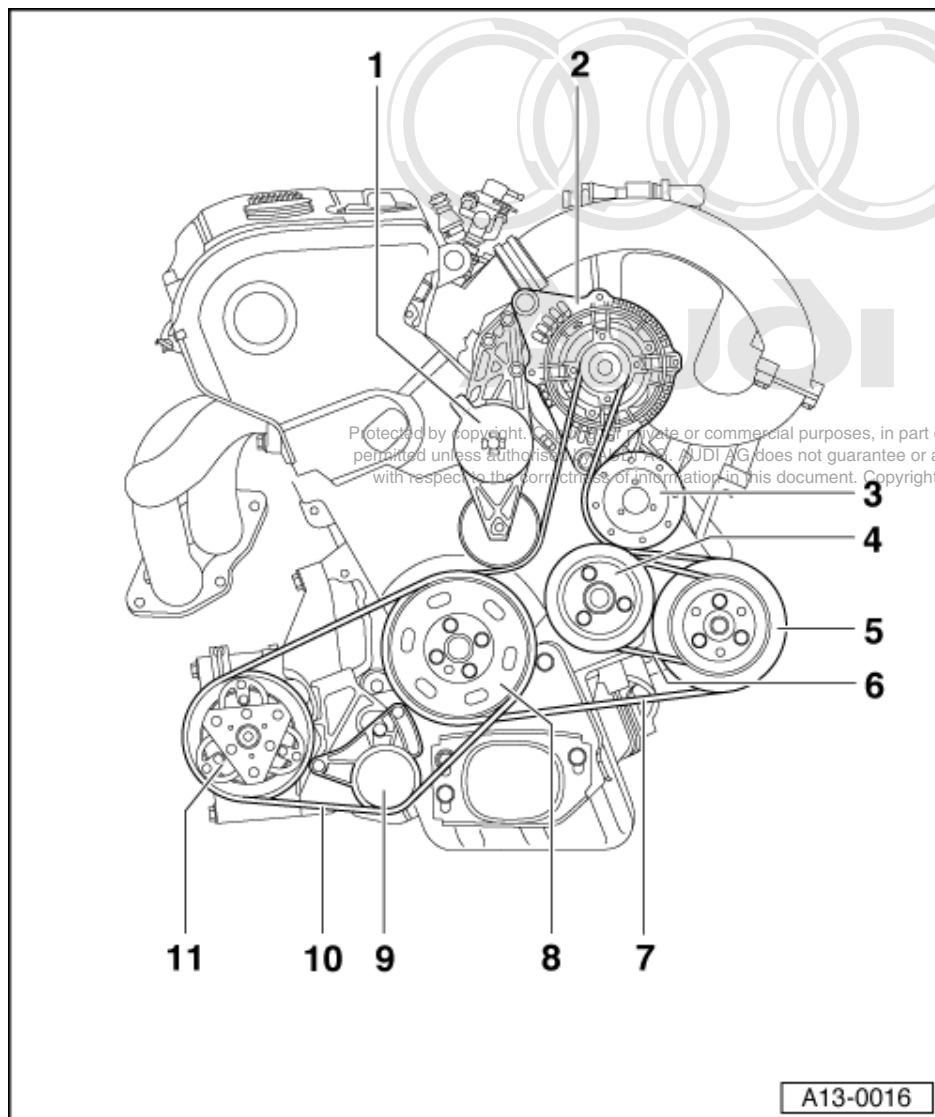
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1.5 - Routing of V-belt and ribbed belts

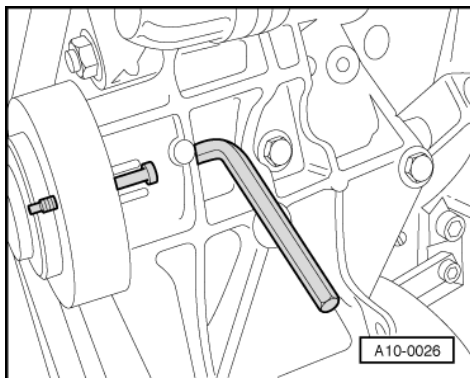


- 1 Tensioning element for ribbed belt
- 2 Alternator
- 3 Viscous coupling
- 4 Coolant pump
- 5 Vane pump
- 6 V-belt
 - ♦ For coolant pump
 - ♦ Removing and installing
=> Page 38
- 7 Ribbed belt
 - ♦ For alternator, vane pump and viscous fan
 - ♦ Removing and installing
=> Page 35

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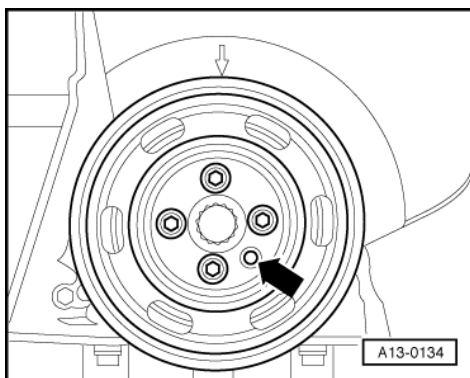


- 8 Vibration damper**
- 9 Tensioning element for ribbed belt**
 - ◆ For A/C compressor
- 10 Ribbed belt**
 - ◆ For A/C compressor
 - ◆ Removing and installing
 - => Page **35**
- 11 A/C compressor**



-> Fig.1 Removing and installing viscous fan

- Lock carrier must be in service position => Page 19 .
- Ribbed belt must be slackened => Page 36 .
- Secure viscous fan pulley in position with 5 x 60 mm bolt, and unscrew with Allen key.
- Remove viscous fan
- When installing, tighten viscous fan bearing to 45 Nm.



-> Fig.2 Installing vibration damper

- Lock carrier must be in service position => Page 19 .
- Ribbed belt must be removed => Page 36 .
- When installing vibration damper, use only correct bolts (strength rating 10.9, same as original equipment):

=> Parts catalogue

- The vibration damper can only be installed in one position. The hole -arrow- in the vibration damper must fit over the projection on the toothed belt sprocket.

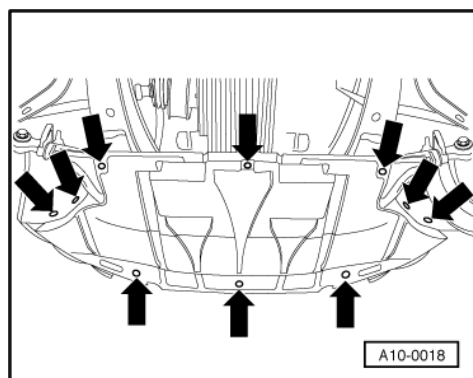
Tighten vibration damper bolts to 40 Nm.

1.6 - Removing and installing ribbed belt

- Lock carrier must be in service position => Page 19 .



Note:

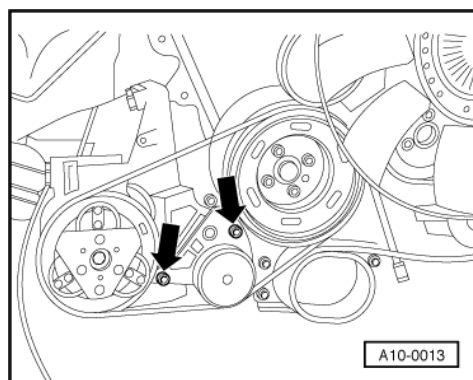


Mark the direction of rotation with chalk or felt pen before removing the ribbed belt. If the belt rotates in the wrong direction when it is refitted, it can break. Ensure that the belt is properly seated on the pulleys when installing.

Removing

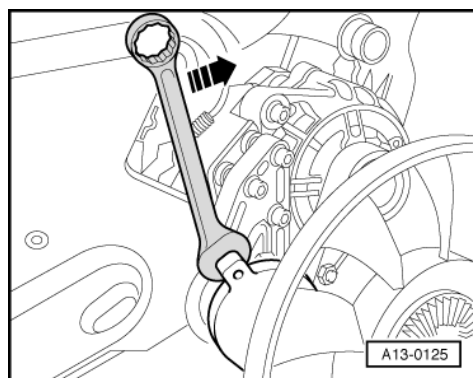
Vehicles with air conditioner:

- -> Remove noise insulation -arrows-.

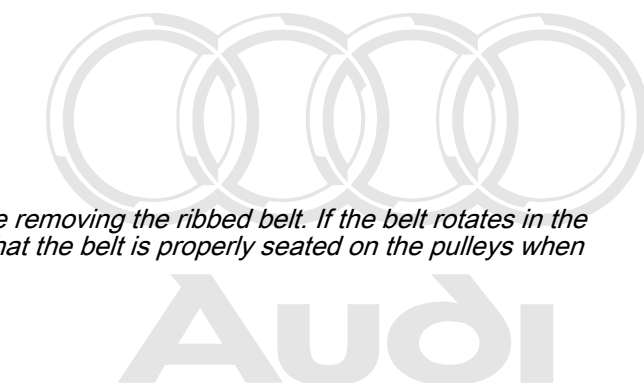


- -> Loosen securing bolts of tensioning roller for ribbed belt for A/C compressor -arrows-. Slacken belt and remove.

All models

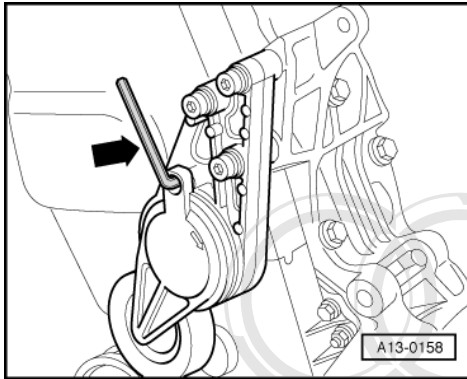


- -> To slacken ribbed belt, turn tensioning element in direction of arrow.



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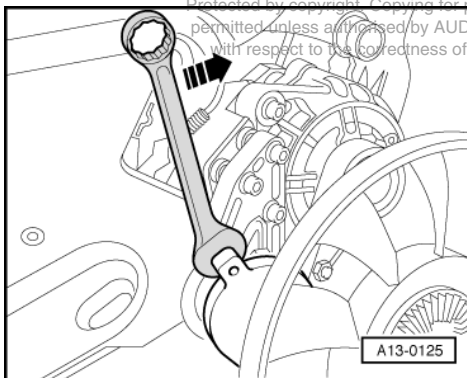
Note:



-> The tensioning element for the ribbed belt can be locked in position by inserting a suitable Allen key -arrow- or mandrel 3204 into the fixing holes.

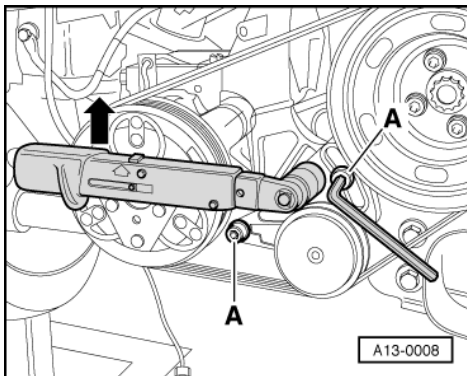
- Remove ribbed belt and release tensioning element.

Installing



- Fit ribbed belt over crankshaft pulley, viscous fan pulley and vane pump pulley. If necessary, pull the belt upwards using a suitable tool.
- -> Turn ribbed belt tensioning element in direction of arrow.
- Fit ribbed belt over alternator pulley last. Release tensioning element.
- Check that ribbed belt is properly seated.
 - Routing of ribbed belt => Page 33

Vehicles with air conditioner:



- Fit ribbed belt for A/C compressor.
 - Routing of ribbed belt => Page 33
- -> Apply torque wrench to hexagon on tensioning roller and tension with a torque of 25 Nm.



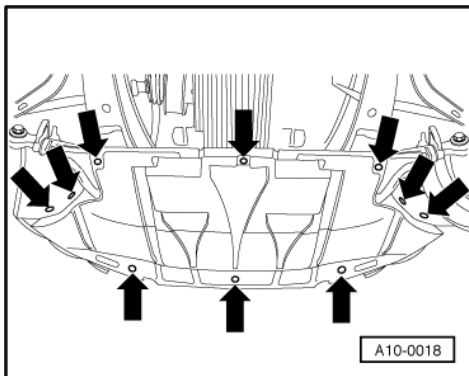
- At the same time, tighten bolts -A- to 20 Nm.

All models

- Start engine and check that belt runs properly.

1.7 - Removing and installing V-belt

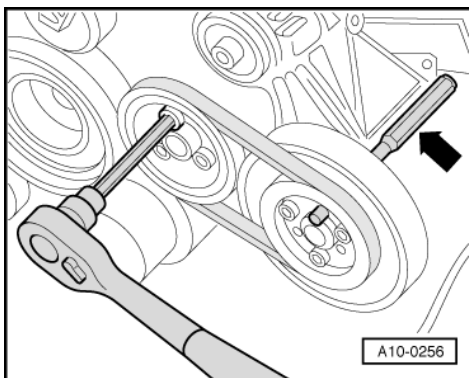
- Lock carrier must be in service position => Page 19 .
- Ribbed belt must be slackened => Page 36 .



Removing

- -> Remove noise insulation -arrows-.
- Remove viscous fan (with belt pulley) from bearing=>Fig. 35 .

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- -> Remove V-belt pulley from coolant pump. Counterhold by inserting a pin -arrow- in the vane pump pulley.
- Remove V-belt.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Fit V-belt on pulleys and assemble two sections of pulley on coolant pump without tightening bolts.
- Tighten the bolts securing the two sections of the pulley in stages while turning the coolant pump.
 - As the bolts are tightened, the V-belt should gradually move outwards until seated on the running surface.
- Tighten bolts to 25 Nm.

Note:

It is not possible to adjust the tension of the V-belt for the coolant pump.

- Fit ribbed belt and release the tensioning element.
- Start engine and check that belt runs properly.
- Check again to make sure that the bolts for the coolant pump pulley are tightened to the correct torque.

1.8 - Removing and installing bearing for viscous fan

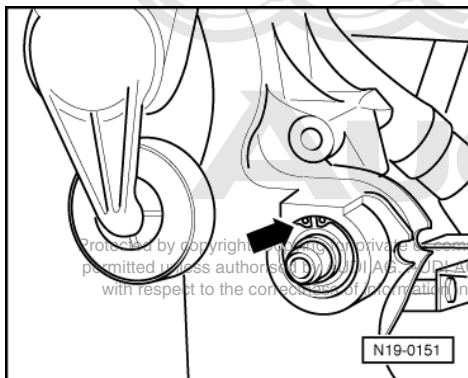
- Lock carrier must be in service position => Page 19 .

Special tools, testers and auxiliary items

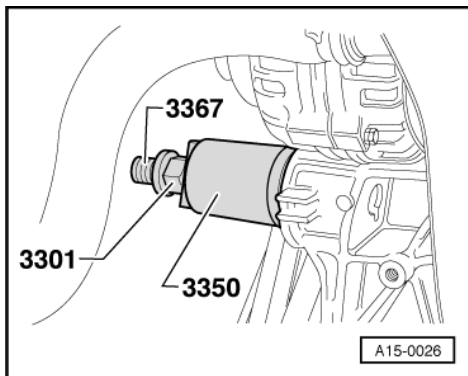
- ◆ Hexagon nut from assembly tool 3301
- ◆ Extractor tube from assembly tool 3350
- ◆ Press tool 3367 for viscous fan coupling bush

Removing

- Remove ribbed belt => Page 36 .
- Remove viscous fan (with belt pulley) => Fig. 35 .



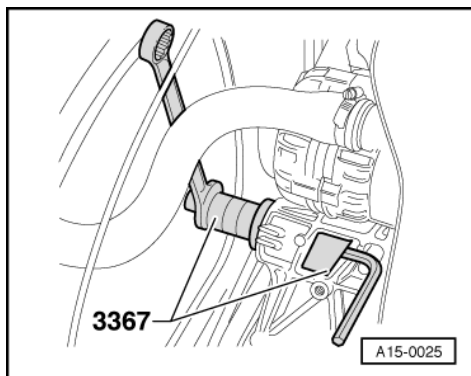
- -> Remove circlip -arrow- for bush.



- -> Pull bearing out of bracket using nut from assembly tool 3301, bolt from press tool for viscous fan 3367 and tube 3350.



Installing



- ➔ Press in bearing with press tool for viscous fan 3367 and nut from assembly tool 3301.
- Fit circlip in bracket for viscous fan using angle circlip pliers.
- Install viscous fan => Fig. 35 .

1.9 - Removing and installing bracket for alternator, vane pump (power steering) and viscous fan

- Lock carrier must be in service position => Page 19 .

Removing

- Obtain radio code on vehicles with coded radio.
- With ignition switched off, disconnect battery earth strap.
- Remove ribbed belt and tensioning element for ribbed belt => Page 36 .

Note:

Ribbed belt for air conditioner does not have to be removed.

- Remove V-belt=> Page 38 .
- Unbolt pulley from vane pump for power steering.
- Unbolt vane pump from bracket for alternator, vane pump and viscous fan, lift clear to one side and tie in place. Do not disconnect hydraulic connections.

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- Perform all steps listed under "Removing and installing coolant pump"=>Page 163 .

Note:

Coolant pump is bolted to bracket for alternator, vane pump and viscous fan.

Installing

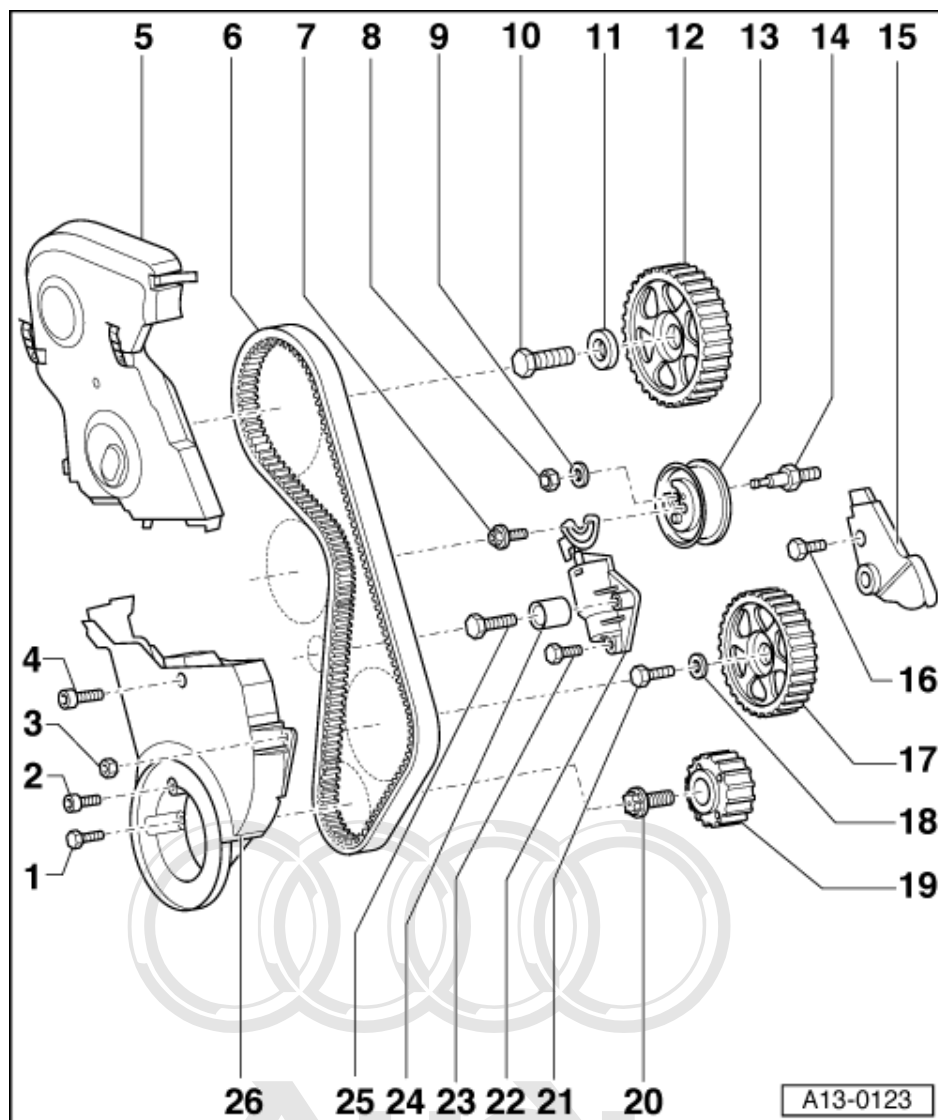
Installation is carried out in the reverse order, when doing this note the following:

- Renew coolant pump seal to prevent leaks.

Tightening torques

Component	Nm
Belt pulley to vane pump	25
Vane pump to bracket for alternator, vane pump and viscous fan	25

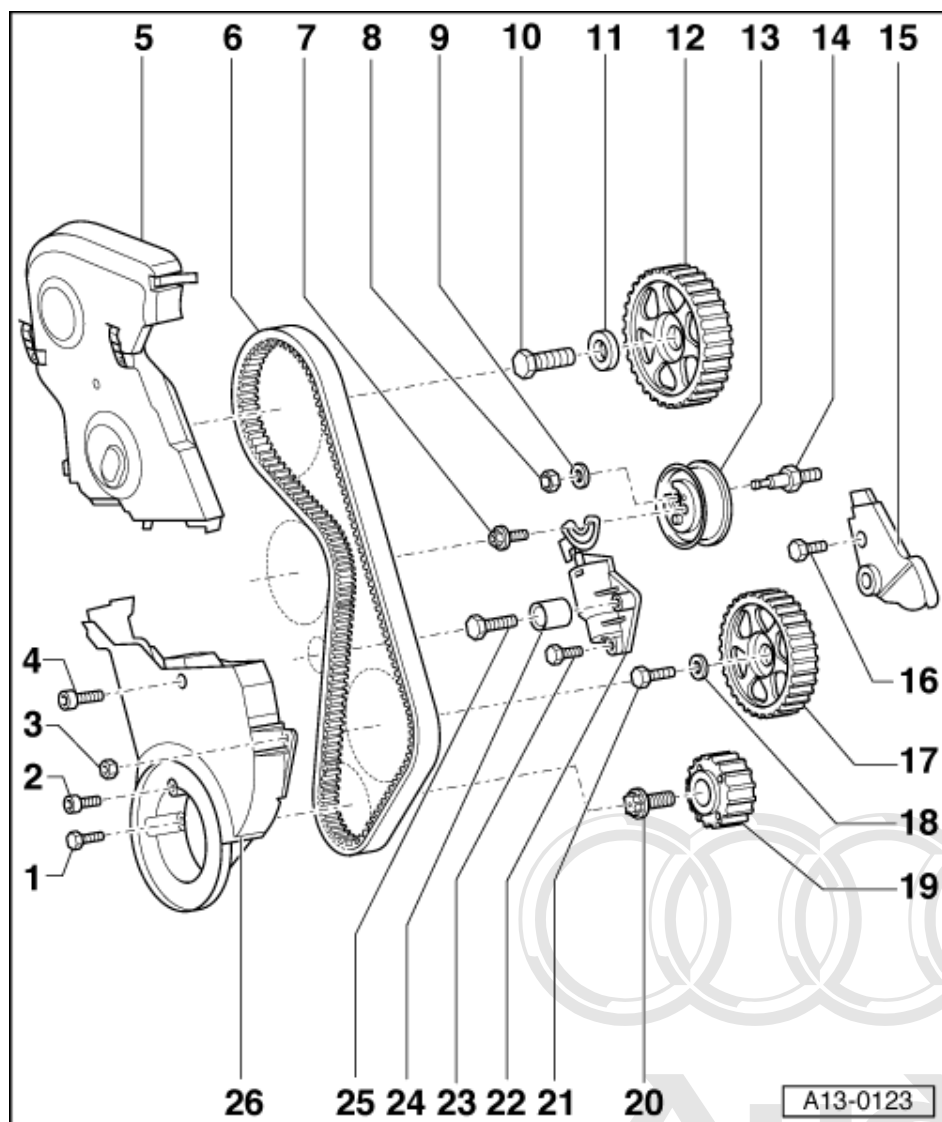
1.10 - Toothed belt driveă 07.97



Note:

Mark the direction of rotation with chalk or felt pen before removing the toothed belt. If a used belt rotates in the wrong direction when refitted, this can result in breakage.

- 1 10 Nm
- 2 10 Nm
- 3 10 Nm
- 4 20 Nm

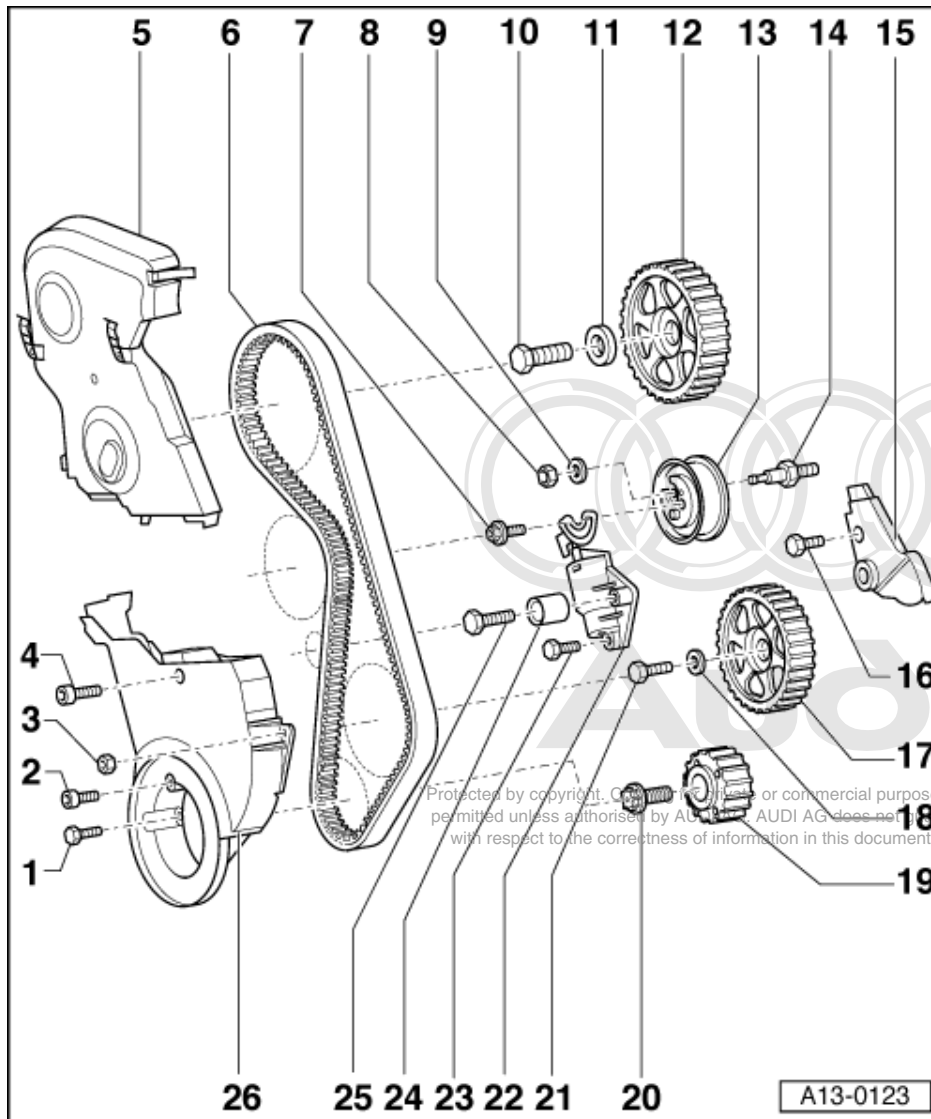
**5 Toothed belt guard - top**

- ◆ Unbolt tensioning roller for ribbed belt before removing.
- ◆ When installing, engage carefully in bottom toothed belt guard

6 Toothed belt

- ◆ Mark direction of rotation with chalk or felt pen before removing
- ◆ Check for wear
- ◆ Removing => Page 46
- ◆ Installing (adjusting valve timing)
=> Page 47

7 25 Nm**8 10 Nm**



9 Washer

10 65 Nm

- ♦ Use counter-hold tool 3036 to loosen and tighten

11 Washer

12 Camshaft sprocket

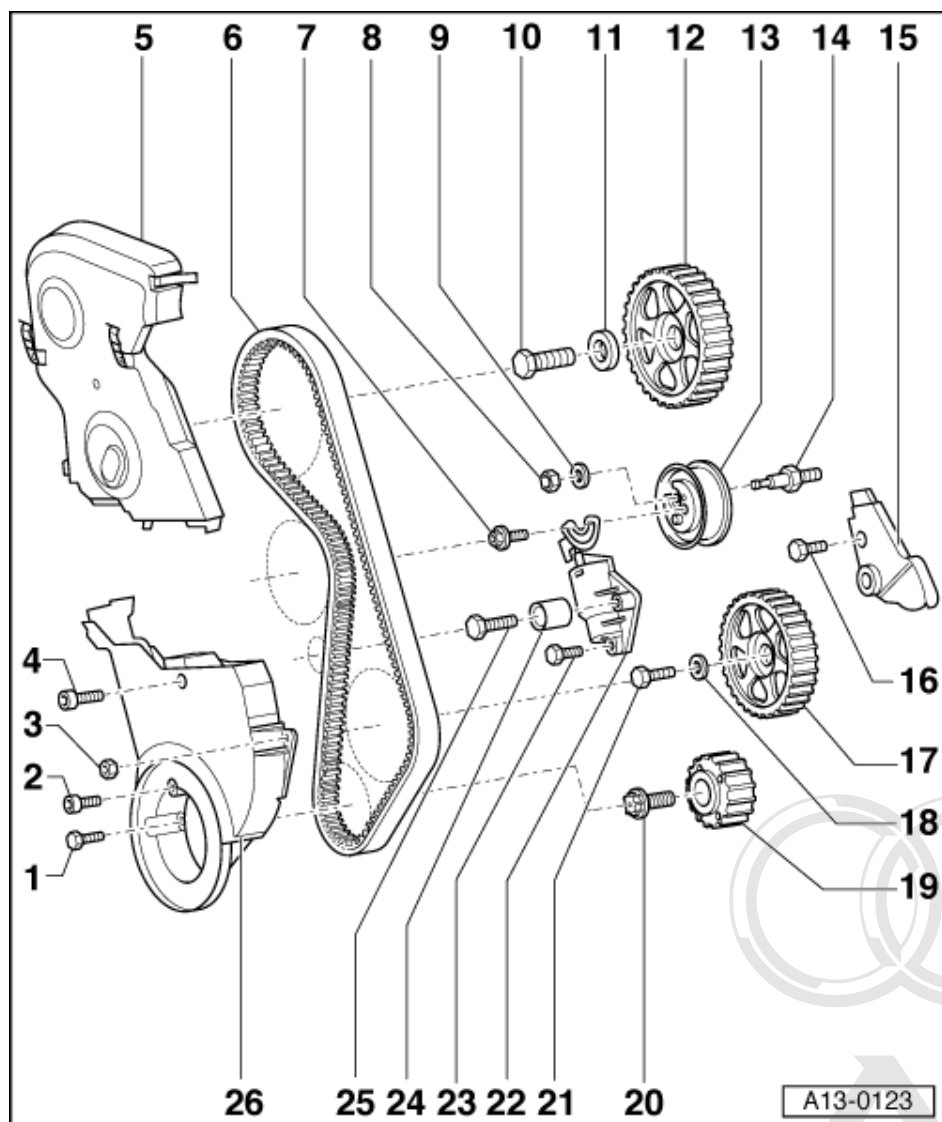
- ♦ For exhaust camshaft
- ♦ To remove and install, first remove toothed belt => Page 46
- ♦ Installation position => Fig. 1

13 Tensioning roller

14 Set bolt - 25 Nm

- ♦ For tensioning roller

15 Toothed belt guard - rear



16 20 Nm

17 Intermediate shaft sprocket

18 Washer

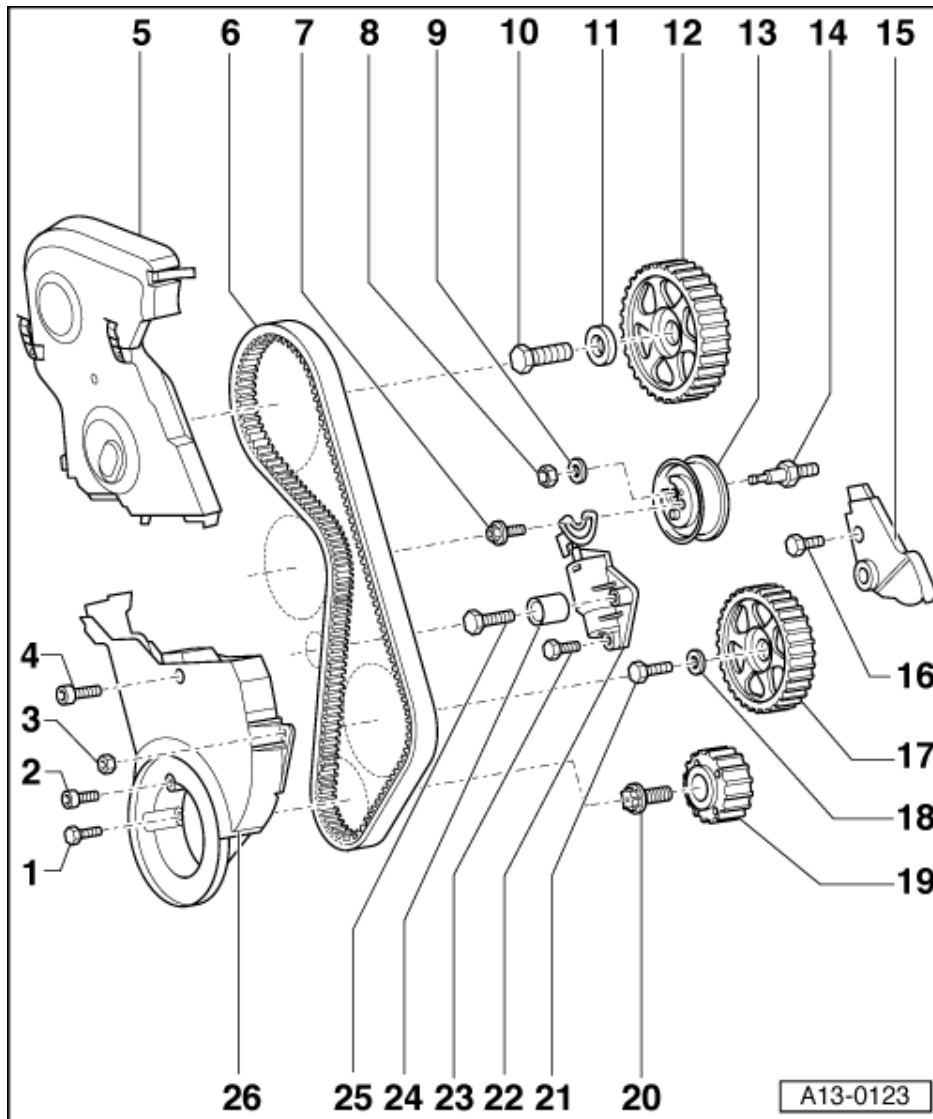
19 Crankshaft sprocket

- ◆ Contact surface between sprocket and crankshaft must be free of oil.
- ◆ Can only be installed in one position.

20 90 Nm + 1/4 turn (90 °) further

- ◆ Renew
- ◆ Do not use oil
- ◆ Counter-hold with 3099 to loosen and tighten
- ◆ Bolting on counter-hold tool 3099
=> Page 63
- ◆ If necessary, remove bracket for torque reaction support (-Item 134) before bolting on counter-hold tool

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21 65 Nm

- ♦ Use counter-hold tool 3036 to loosen and tighten

22 Tensioner for toothed belt

23 10 Nm

24 Idler roller

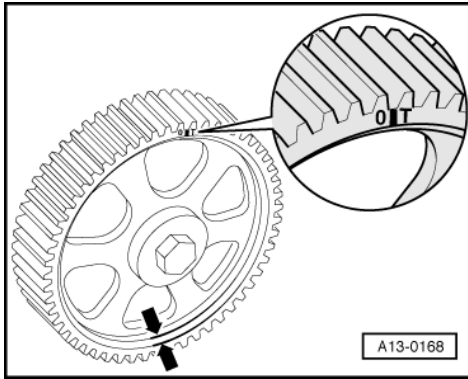
25 25 Nm

26 Toothed belt guard - bottom

- ♦ To remove, unbolt vibration damper



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-> Fig.1 Installation position of camshaft sprocket

- ♦ Narrow web on camshaft sprocket faces outwards -arrows- and marking for No. 1 cylinder TDC is visible.

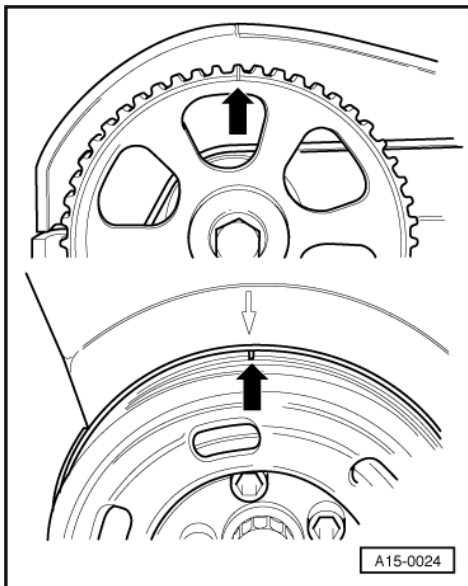
1.11 - Removing and installing toothed beltä 07.97

Removing

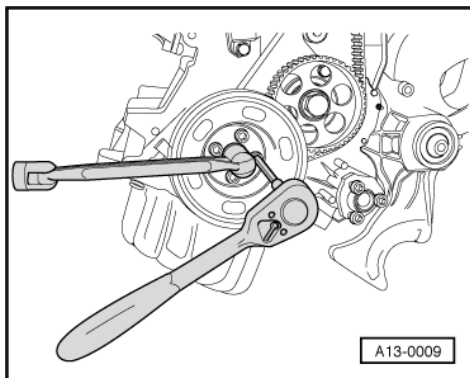
- Engine in vehicle
- Lock carrier must be in service position => Page 19 .

Special tools, testers and auxiliary items

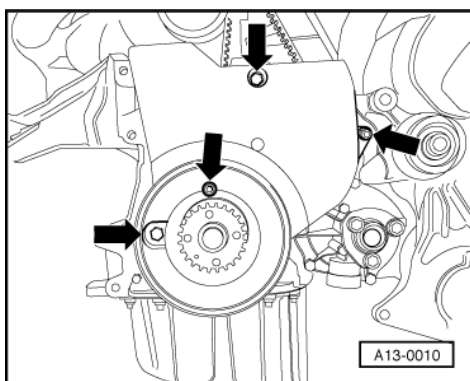
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- ♦ Pinwrench Matra V159



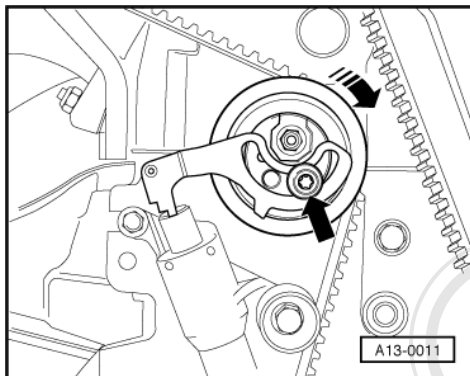
- Remove ribbed belt and tensioning element for ribbed belt => Page 36 .
- Remove viscous fan coupling (with belt pulley) => Fig. 35 .
- Remove toothed belt guard (top).
- Mark direction of rotation of belt with chalk or felt pen.
- -> Set crankshaft to markings for TDC of No. 1 cylinder -arrows- by turning central bolt on crankshaft sprocket in direction of rotation.



- -> Unbolt vibration damper.



- -> Unbolt toothed belt guard (bottom section) -arrows-.

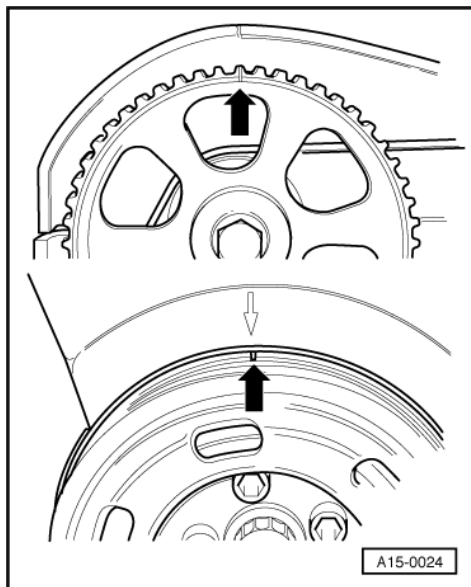


- -> Loosen toothed belt tensioner with Torx wrench T45 -lower arrow-.
- Press toothed belt tensioner downwards.
- Take off toothed belt.

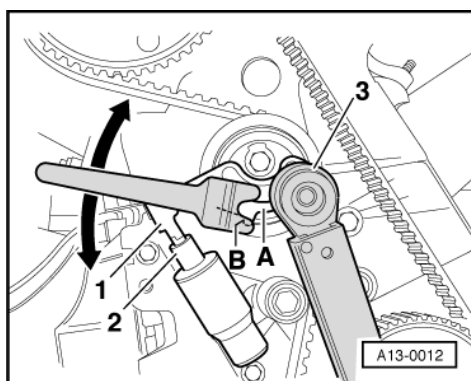
Installing (adjusting valve timing)

Notes:

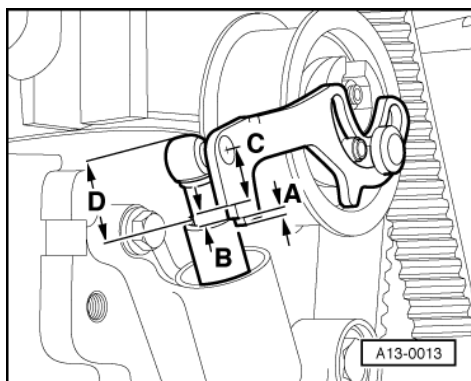
- ♦ The position of the toothed belt must be set as described below, even after repairs in which the belt is only taken off the camshaft sprocket.
- ♦ The crankshaft must not be at TDC at any cylinder when the camshaft is turned. Otherwise there is a risk of damage to valves and piston crowns.
- ♦ The setting can be performed with engine cold or engine warm.



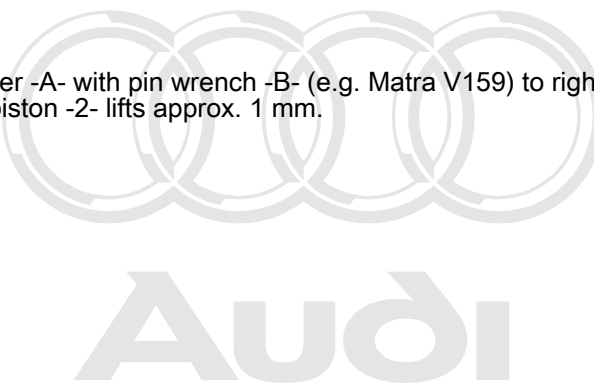
- -> Align marking on camshaft sprocket with marking on cylinder head cover.
- Place toothed belt on crankshaft sprocket (observe direction of rotation).
- Install toothed belt guard - lower part.
- Secure vibration damper/belt pulley with one bolt (note fixing arrangement).
- Turn crankshaft to TDC No. 1 cylinder.
- Place toothed belt on tensioning roller and camshaft sprocket.



- -> Tension toothed belt: to do this turn tensioner -A- with pin wrench -B- (e.g. Matra V159) to right until the piston -1- is fully extended and the tensioner piston -2- lifts approx. 1 mm.
- Tighten securing bolt -3- hand-tight.
- Turn crankshaft two full turns.



- -> Check whether area -A- coincides with upper end of piston -2- (=> Fig. A13-0012); adjust if necessary.
- Area -A-:
Setting OK
- Area -B-:
Wear zone

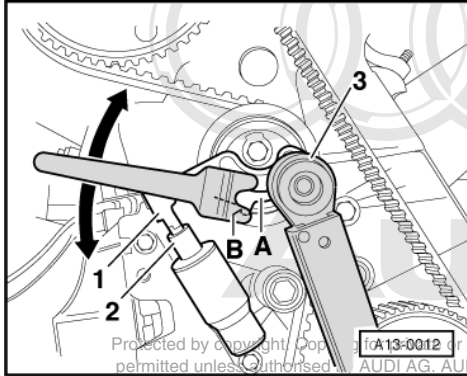


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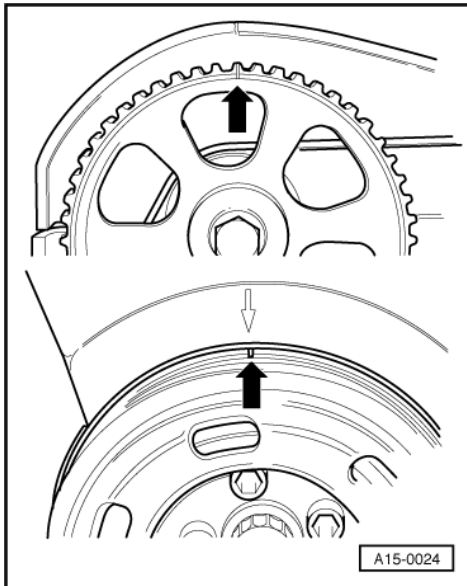
- Area -C-:
Make new adjustment, or check belt drive including tensioner for wear.

Note:

If the end of the piston is in area -A-, this corresponds to a distance -D- of 25 ... 29 mm.



- -> Counter-hold toothed belt tensioner with pin wrench -B- and tighten securing bolt -3-.



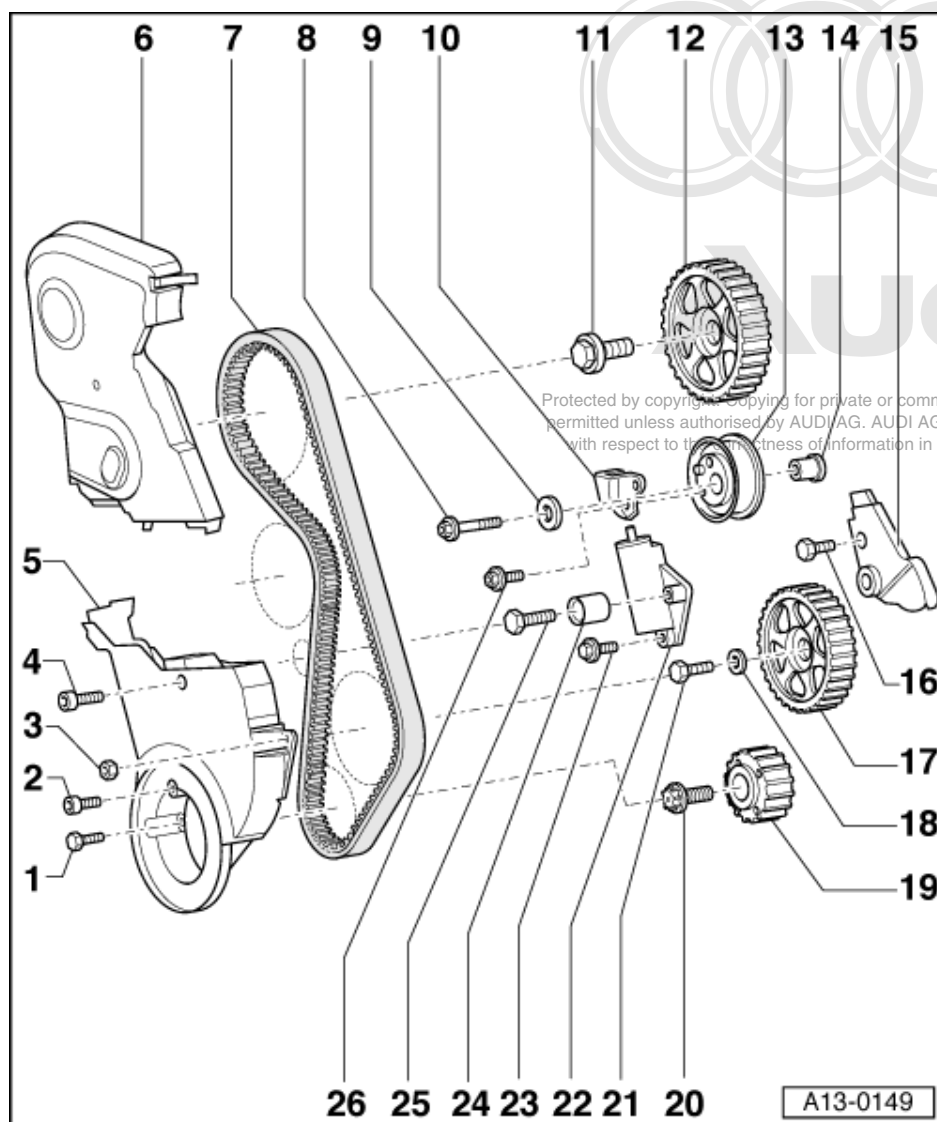
- -> Turn crankshaft two full turns in direction of rotation (by turning central bolt on crankshaft sprocket), and check that camshaft and crankshaft marks align with their reference points.
- Install vibration damper/belt pulley.
- Install toothed belt guard (top section).
- Install ribbed belt and ribbed belt tensioning element=>Page 37 .

Tightening torques

Component	Nm
Toothed belt tensioner to tensioning roller	25
Toothed belt guard (bottom) to cylinder block M6	10
M8	20
Vibration damper/belt pulley to crankshaft	40 1)
Ribbed belt tensioner to bracket	25

- 1) Bolt strength rating 10.9

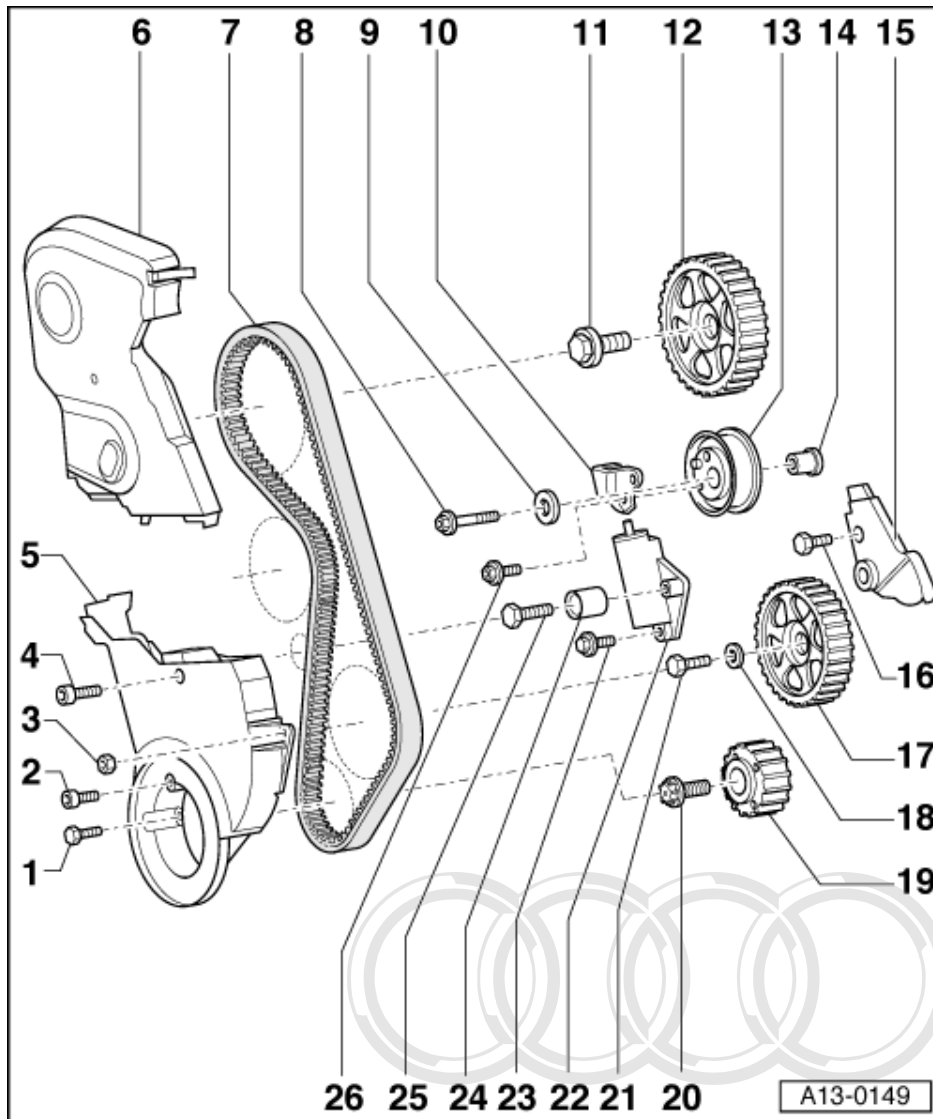
1.12 - Toothed belt drive 08.97 ä



Note:

Mark the direction of rotation with chalk or felt pen before removing the toothed belt. If a used belt rotates in the wrong direction when refitted, this can result in breakage.

- 1 10 Nm
- 2 10 Nm
- 3 10 Nm
- 4 20 Nm
- 5 **Toothed belt guard - bottom**
 - ♦ Unbolt vibration damper before removing



6 Toothed belt guard - top

- ◆ Unbolt ribbed belt tensioning roller before removing
- ◆ When installing, engage carefully in bottom toothed belt guard

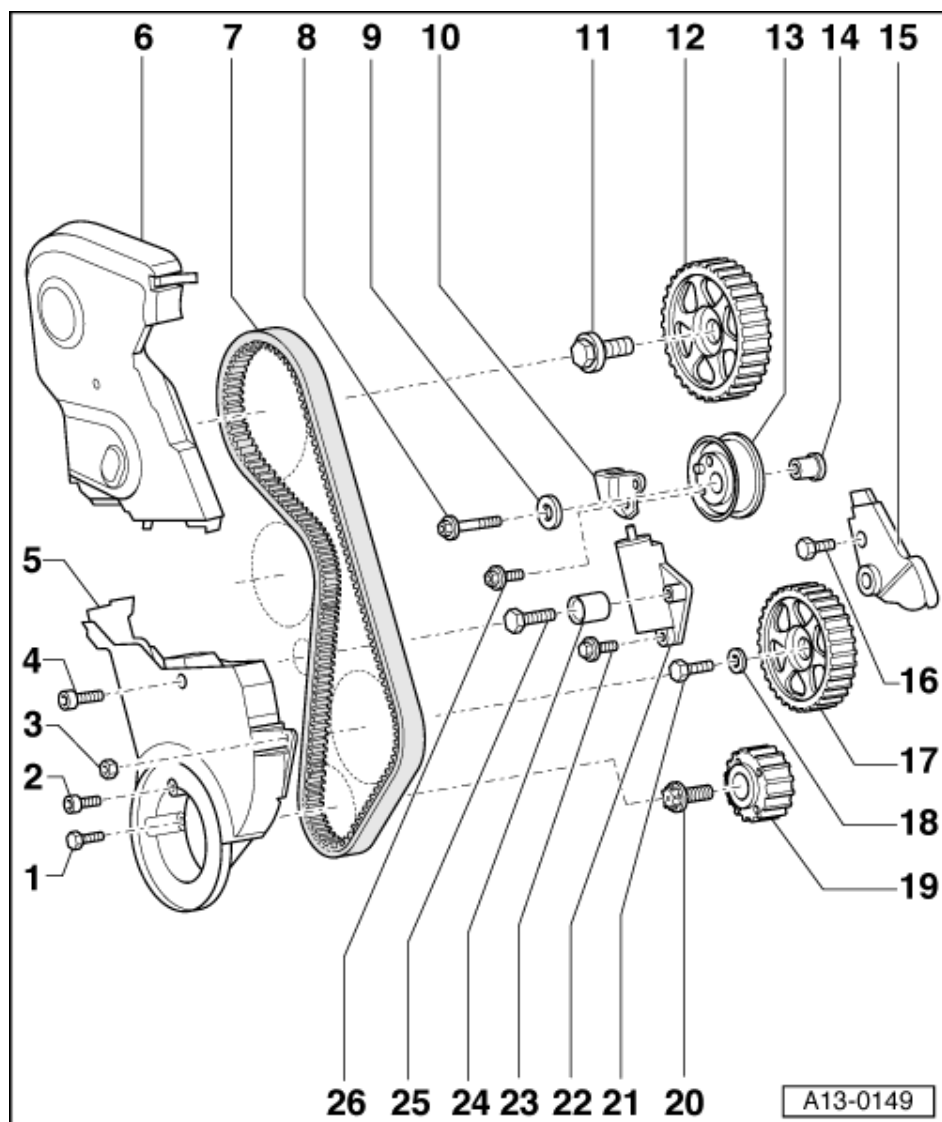
7 Toothed belt

- ◆ Mark direction of rotation with chalk or felt pen before removing
- ◆ Check for wear
- ◆ Removing=>Page 55
- ◆ Installing (adjusting valve timing)
=>Page 56

8 40 Nm

9 Washer

10 Lever



11 65 Nm

- ♦ Use counter-hold 3036 to loosen and tighten

12 Camshaft sprocket

- ♦ For exhaust camshaft
- ♦ To remove and install, first remove toothed belt=>Page 55
- ♦ Installation position=>Fig. 1

13 Tensioning roller

14 Bearing sleeve

- ♦ For tensioning roller

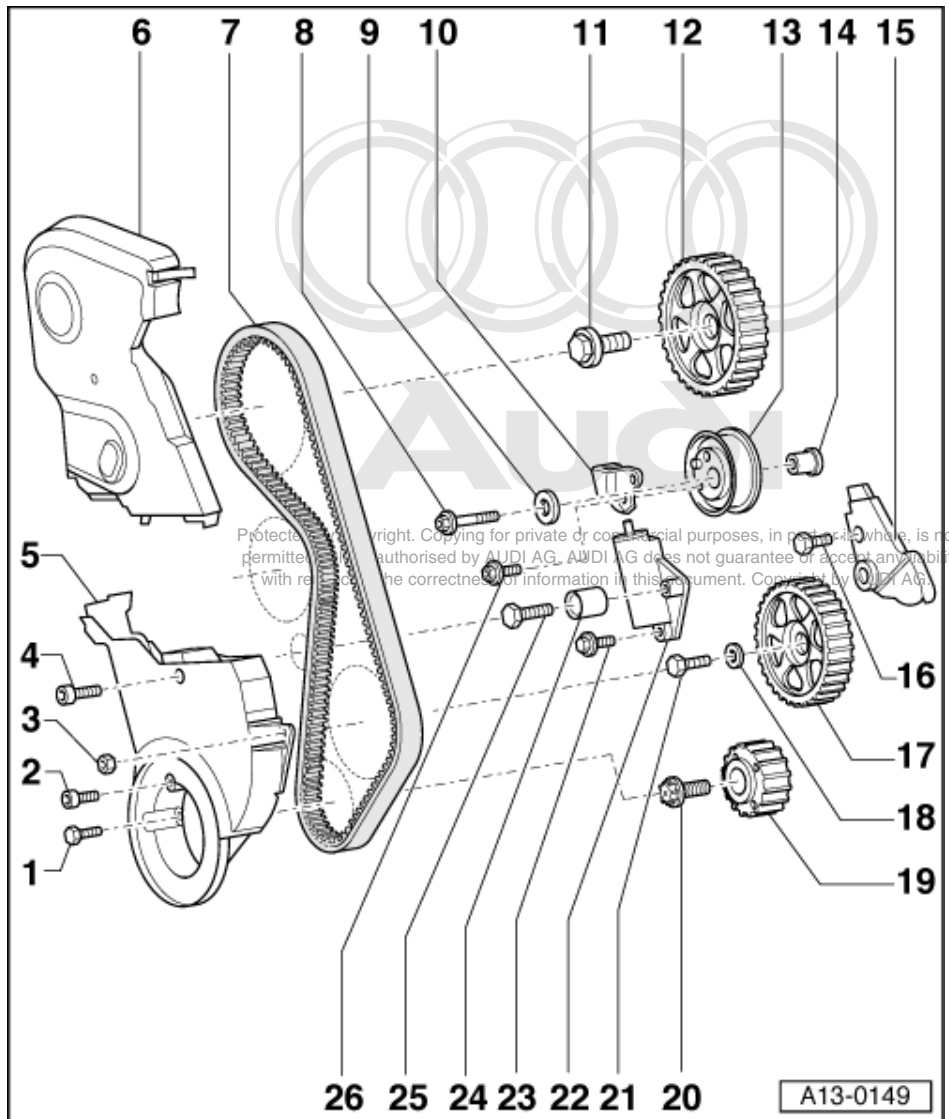
15 Toothed belt guard - rear

16 20 Nm

17 Intermediate shaft sprocket



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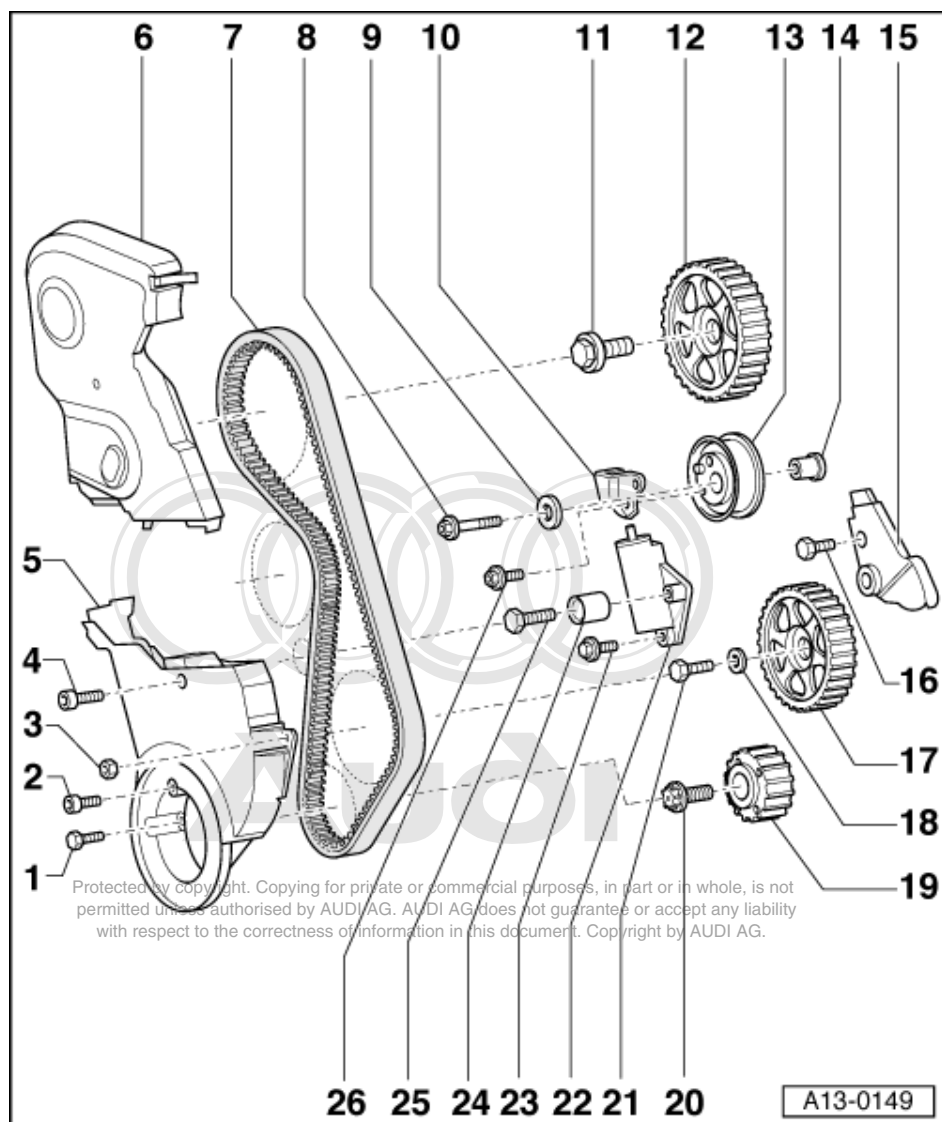
18 Washer

19 Crankshaft sprocket

- ◆ Contact surface between sprocket and crankshaft must be free of oil.
- ◆ Can only be installed in one position.

20 90 Nm + 1/4 turn (90 °) further

- ◆ Renew
- ◆ Do not use oil
- ◆ Counter-hold with 3099 to loosen and tighten
- ◆ Bolting on counter-hold tool 3099
 => Page 63
- ◆ If necessary, remove bracket for torque reaction support (-Item 134) before bolting on counter-hold tool



21 65 Nm

- ♦ Use counter-hold tool 3036 to loosen and tighten

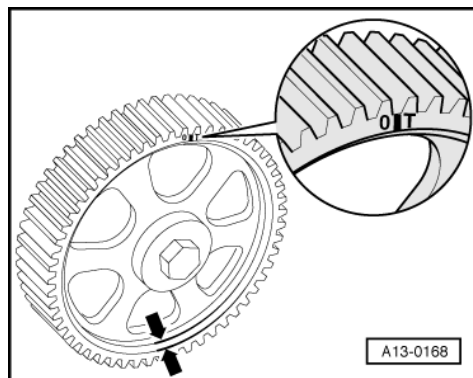
22 Tensioner for toothed belt

23 10 Nm

24 Idler roller

25 25 Nm

26 10 Nm



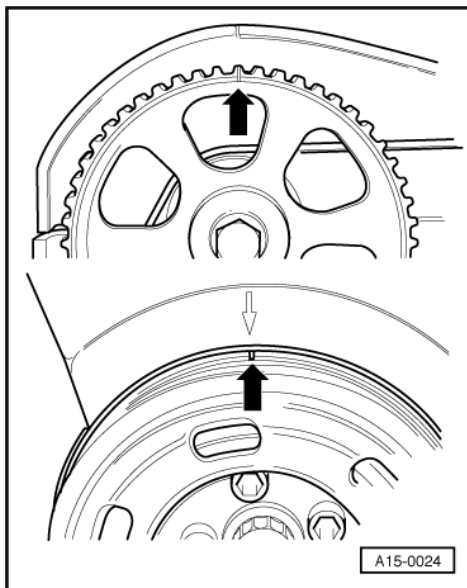
-> Fig.1 Position of camshaft sprocket

- ♦ Narrow web on camshaft sprocket faces outwards -arrows- and marking for No. 1 cylinder TDC is visible.

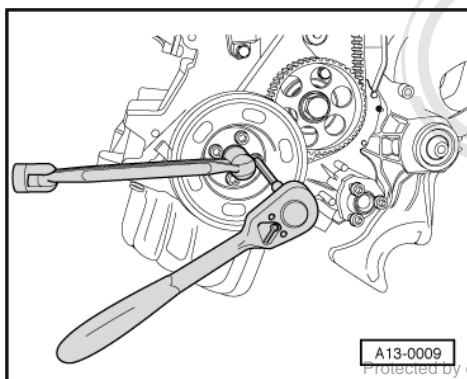
1.13 - Removing and installing toothed belt 08.97 ä

Removing

- Engine in vehicle
- Lock carrier must be in service position => Page 19 .
- Remove ribbed belt and tensioning element for ribbed belt => Page 36 .
- Remove viscous fan coupling (with belt pulley) => Fig. 35 .

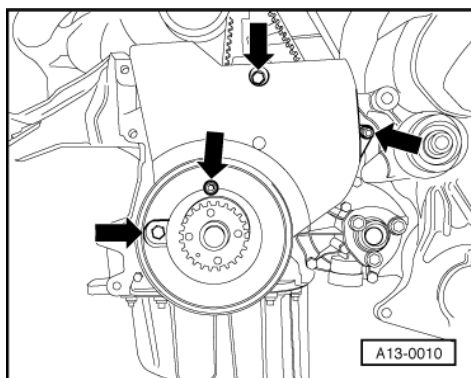


- Remove toothed belt guard (top).
- Mark direction of rotation of belt with chalk or felt pen.
- -> Set crankshaft to markings for TDC of No. 1 cylinder -arrows- by turning central bolt on crankshaft sprocket in direction of rotation.

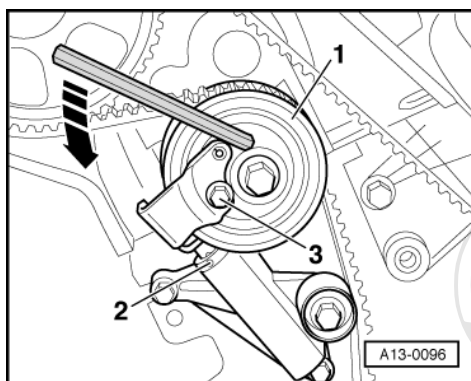


- -> Unbolt vibration damper.

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- -> Unbolt toothed belt guard (bottom section) -arrows-.



- -> Using 8 mm hexagon key, turn toothed belt tensioning roller -1- slowly and with constant firm pressure in direction of arrow, so that holes -2- in tensioner piston and housing are aligned.
- With the tensioner in this position, insert a suitable retaining pin (such as a 2 mm drill bit or nail) into the two holes.
- Take off toothed belt.

Note:

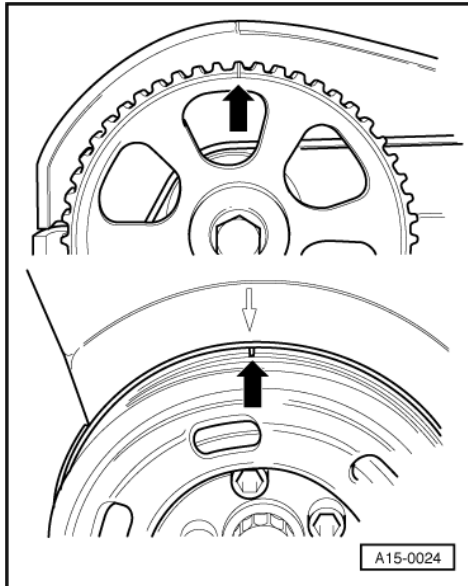
Do not loosen bolt -3-.

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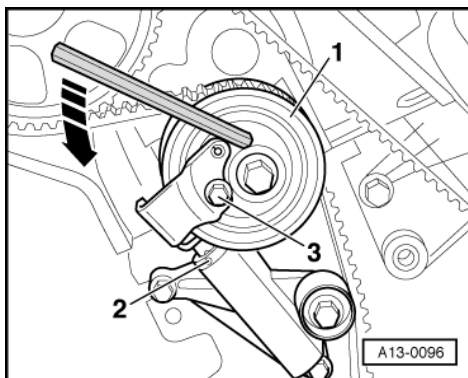
Installing (adjusting valve timing)

Notes:

- ♦ The position of the toothed belt must be set as described below, even after repairs in which the belt is only taken off the camshaft sprocket.
- ♦ The crankshaft must not be at TDC at any cylinder when the camshaft is turned. Otherwise there is a risk of damage to valves and piston crowns.
- ♦ The setting can be performed with engine cold or engine warm.



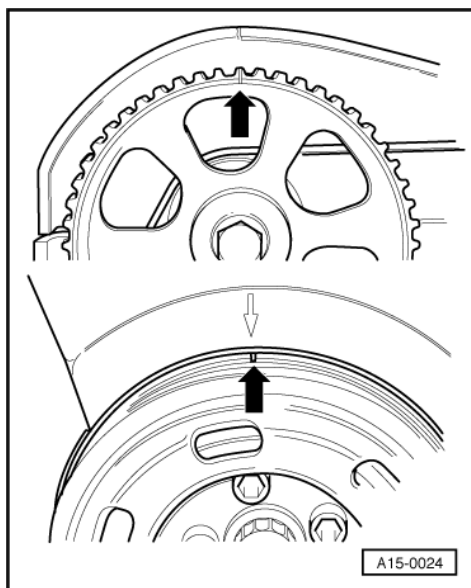
- -> Align marking on camshaft sprocket with marking on cylinder head cover.
- Place toothed belt on crankshaft sprocket (observe direction of rotation).
- Install toothed belt guard - lower part.
- Secure vibration damper/belt pulley with one bolt (note fixing arrangement).
- Turn crankshaft to TDC No. 1 cylinder.
- Place toothed belt on tensioning roller and camshaft sprocket.



- -> Using 8 mm hexagon key, turn toothed belt tensioning roller -1- in direction of arrow until the retaining pin can be pulled out of the tensioner.

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- -> Turn crankshaft two full turns in direction of rotation (by turning central bolt on crankshaft sprocket), and check that camshaft and crankshaft marks align with their reference points.
- Install vibration damper/belt pulley.
- Install toothed belt guard (top section).
- Install ribbed belt and ribbed belt tensioning element=>Page 37 .

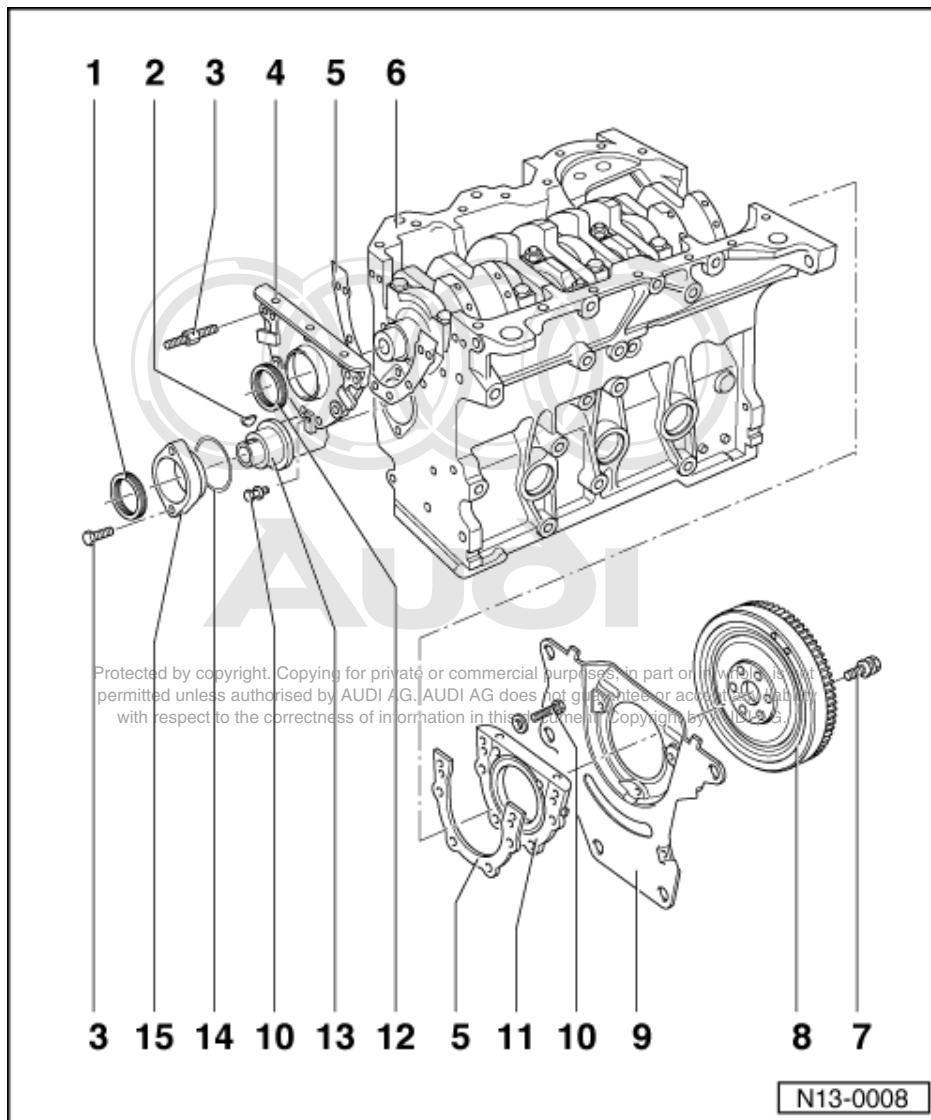
Tightening torques

Component	Nm
Toothed belt guard (bottom) to cylinder block	M6 10
	M8 20
Vibration damper/belt pulley to crankshaft	40 1)
Ribbed belt tensioner to bracket	25

- 1) Bolt strength rating 10.9

2 - Removing and installing sealing flange and flywheel/drive plate

2.1 - Removing and installing sealing flange and flywheel/drive plate



Note:

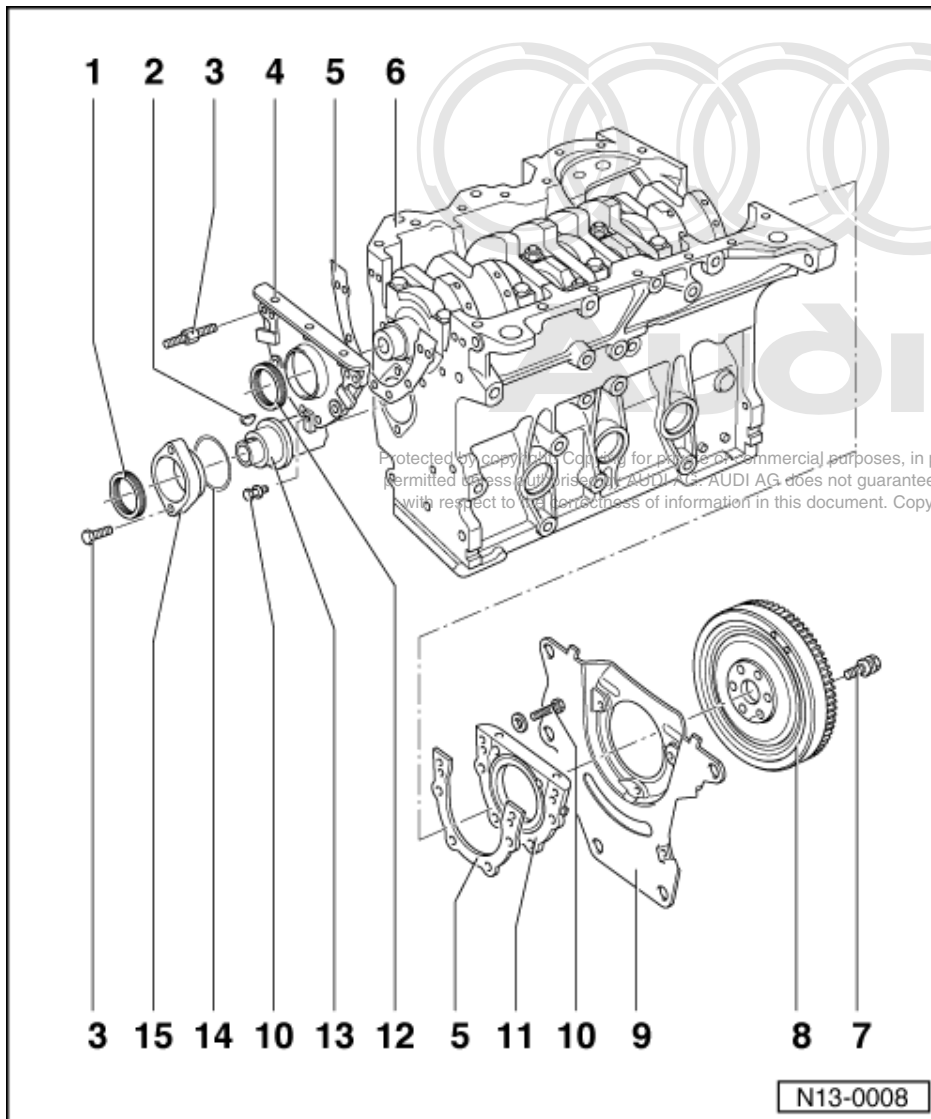
For repairs to the clutch:

=> 5-Speed manual gearbox 012, Front-wheel drive; Repair group 30; Servicing clutch Servicing clutch

=> 5-Speed manual gearbox 01A; Repair group 30; Servicing clutch Servicing clutch

1 Oil seal

- ◆ To remove, remove sealing flange -Item **15** -
- ◆ Install with 10-203
- ◆ Lightly oil sealing lip



2 Woodruff key

- ◆ Ensure tight fit

3 25 Nm

4 Front sealing flange

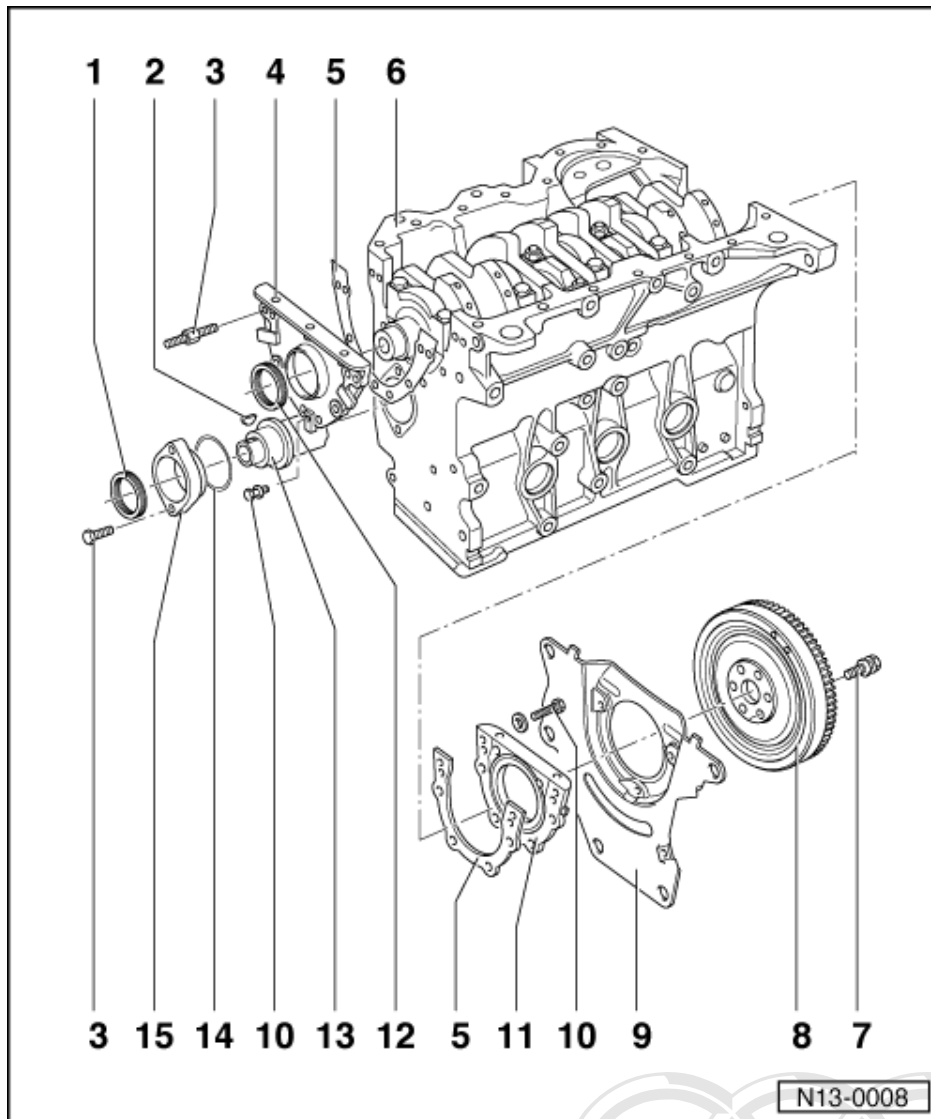
- ◆ Before fitting sump, apply a small amount of sealant "AMV 174 004 01" to sealing points between sealing flange and cylinder block

5 Gasket

- ◆ Renew

6 Cylinder block

- ◆ Removing and installing crankshaft => Page 68
- ◆ Dismantling and assembling pistons and conrods => Page 73



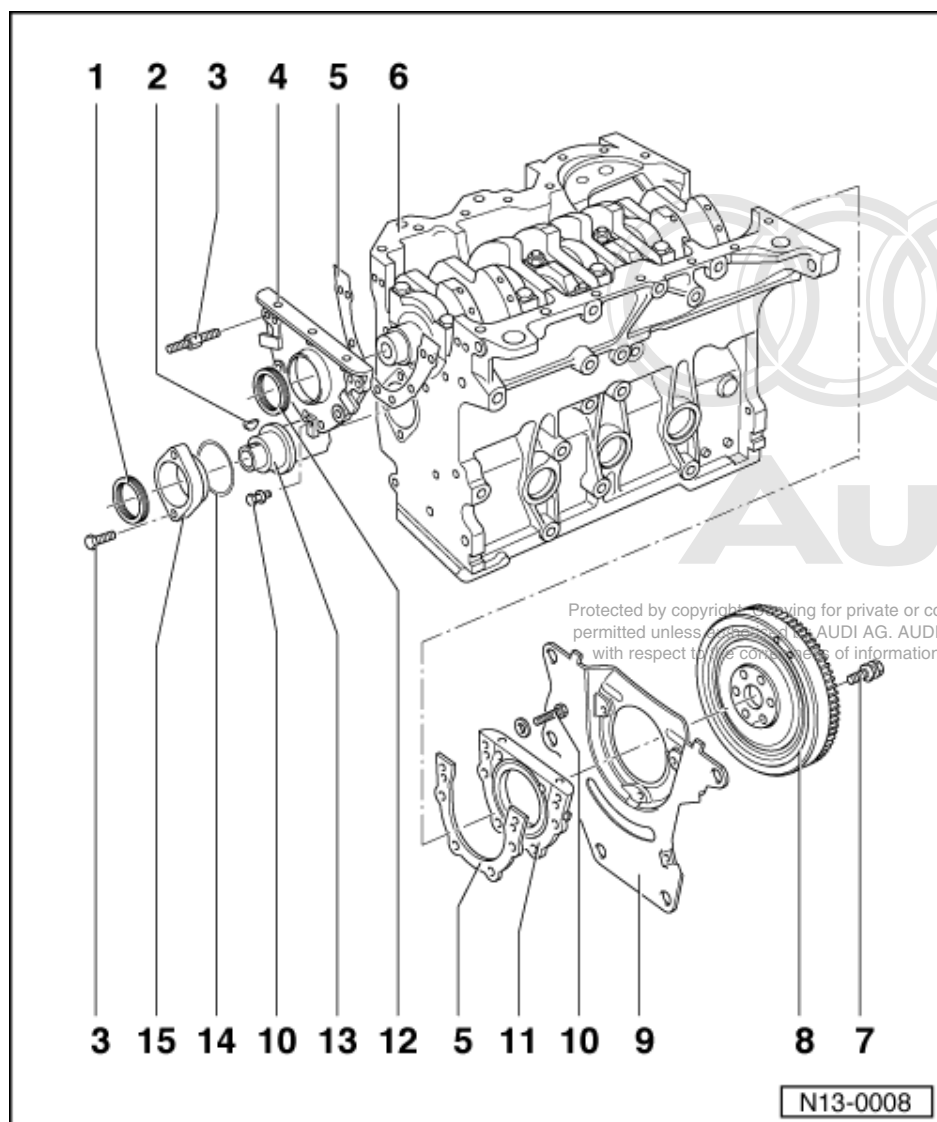
7 Securing bolt for dual-mass flywheel or drive plate

- ◆ Renew
- ◆ Tightening torque for dual-mass flywheel: 60 Nm + 1/2 turn (180°) further
- ◆ Tightening torque for drive plate (vehicles with automatic gearbox): 60 Nm + 1/4 turn. (90°) further

8 Dual-mass flywheel/drive plate

- ◆ Removing and installing dual-mass flywheel =>Page 66
- ◆ Removing and installing drive plate =>Page 66

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9 Intermediate plate

- ♦ Must be located on dowel sleeves
- ♦ Do not damage/bend when assembling

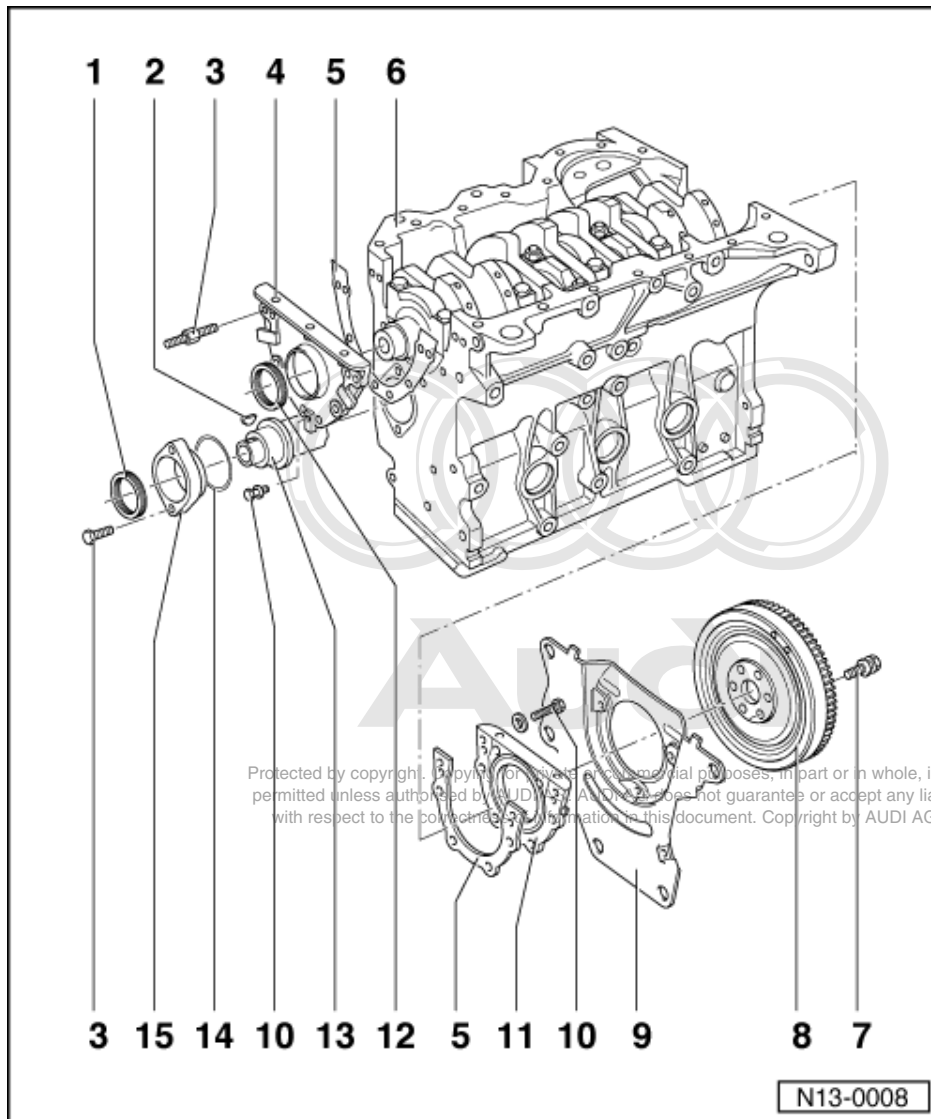
10 10 Nm

11 Rear sealing flange

- ♦ With oil seal
- ♦ Only renew complete
- ♦ Lightly oil sealing lip of oil seal
- ♦ Before fitting sump, apply a small amount of sealant "AMV 174 004 01" to sealing points between sealing flange and cylinder block

12 Oil seal

- ♦ Renewing => Page 63



13 Intermediate shaft

- ♦ Axial clearance max. 0.25 mm

14 O ring

- ♦ Renew

15 Sealing flange for intermediate shaft

2.2 - Renewing crankshaft oil seal - pulley end -

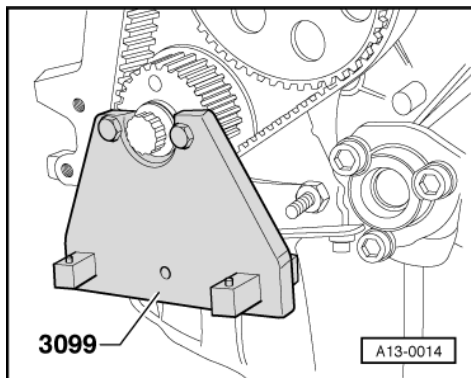
- Engine in vehicle
- Lock carrier must be in service position => Page 19 .

Special tools, testers and auxiliary items

- ♦ Oil seal extractor 2085
- ♦ Oil seal fitting tool 3083
- ♦ Counter-hold tool 3099

Removing

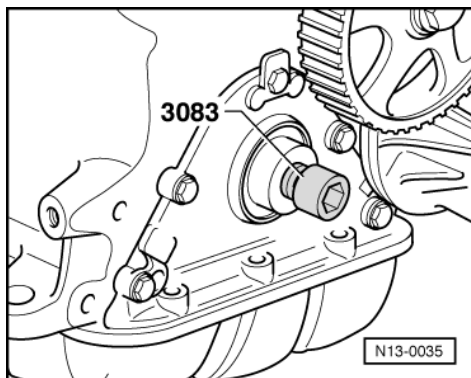
- Remove ribbed belt and ribbed belt tensioning element=>Page 36 .



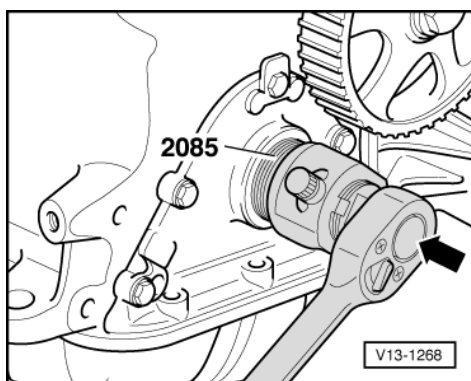
- Remove toothed belt => Page 46 .
- On vehicles with air conditioner, unbolt bracket for torque reaction support -Item 134 .
- -> Remove crankshaft toothed belt sprocket. To do this counter-hold sprocket with 3099.

Note:

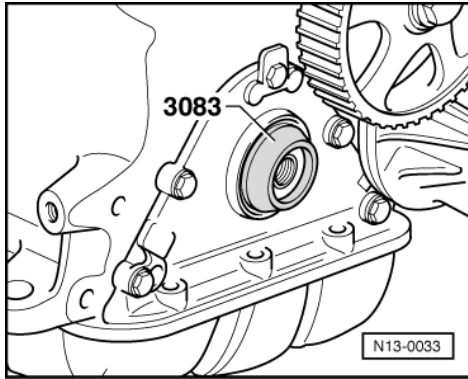
It is also possible to use special tool 3415.



- -> Before applying oil seal extractor, screw cheese-head bolt from 3083 into crankshaft as far as it will go.

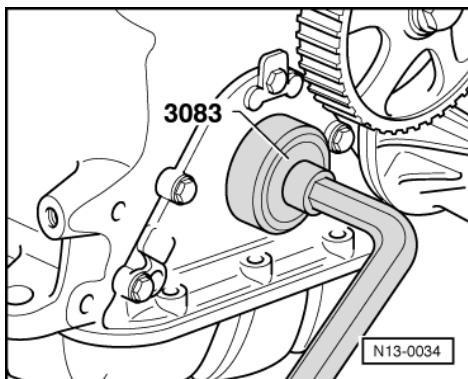


- Unscrew inner part of the oil seal extractor 2085 two turns (approx. 3 mm) out of the outer part and lock with knurled screw.
- -> Lubricate threaded head of oil seal extractor, place it in position and exerting firm pressure screw it as far as possible into oil seal.
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.



Installing

- Lightly oil sealing lip of oil seal.
- -> Place guide sleeve from 3083 onto crankshaft journal.
- Slide oil seal over guide sleeve.



- -> Press oil seal in onto stop using press sleeve and bolt from 3083.
- Renew bolt for toothed belt sprocket.
- Install crankshaft sprocket and lock in position with retainer 3099.

Notes:

- ◆ Contact surface between toothed belt sprocket and crankshaft must be free of oil.
- ◆ Do not oil bolt for crankshaft sprocket.
- Install toothed belt (adjust valve timing)=>Page 56 .
- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 25 Nm.
- Install ribbed belt and ribbed belt tensioning element=>Page 37 .

Tightening torque

Component	Nm
Toothed belt sprocket to crankshaft	90 + 90° 1) 2)

- 1) Renew bolt
- 1) 90°= 1/4turn

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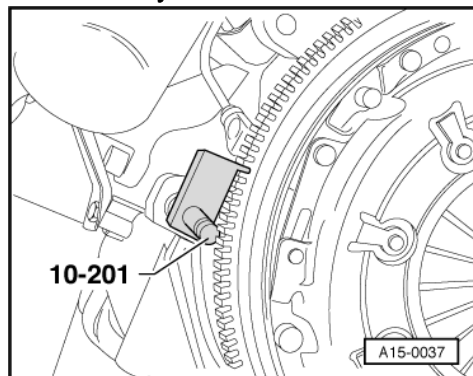


2.3 - Removing and installing dual mass flywheel/ drive plate

Special tools, testers and auxiliary items

- ♦ Counter-hold tool 10-201

Dual-mass flywheel



- -> Reverse position of retainer 10-201 for loosening/tightening bolts.
- Mark position of flywheel relative to engine.
- Renew bolts.

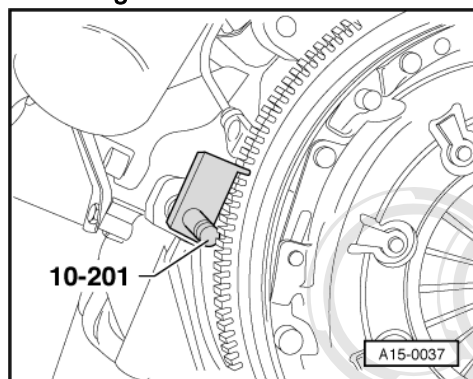
Tightening torque

Component	Nm
Dual-mass flywheel to crankshaft	60 + 180°1)

1) 180° = 1/2 turn

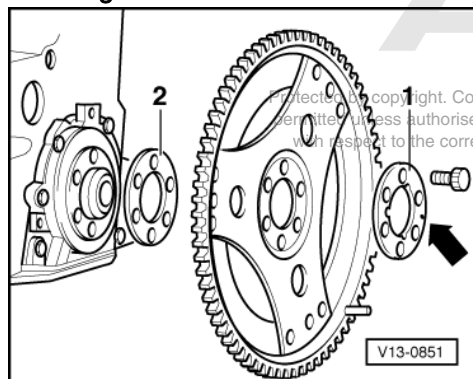
Drive plate

Removing

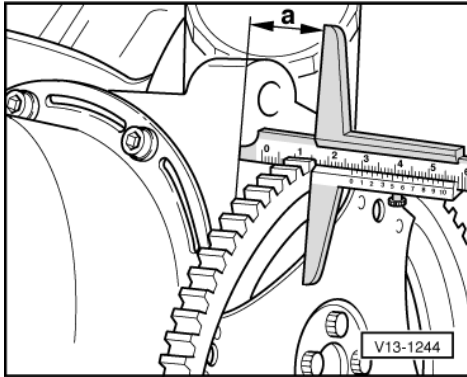


- -> Reverse position of retainer 10-201 for loosening/tightening bolts.
- Mark position of drive plate relative to engine.

Installing

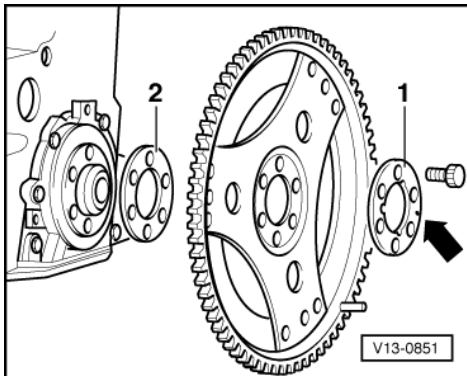


- -> Locate drive plate with shim -2- and packing plate -1-. The lug -arrow- must face towards torque converter.
- Insert at least 3 old securing bolts -3- and tighten to 30 Nm.



- -> Measure distance -a- at three points and calculate average value.
- Specification for automatic gearbox 01N:
26 ... 28 mm

- If the distance is too large:



- -> Remove drive plate again and install without shim -2-. Tighten bolts to 30 Nm again.
- Measure distance again.

- If specification is achieved:

- Fit new bolts and tighten.

Tightening torque

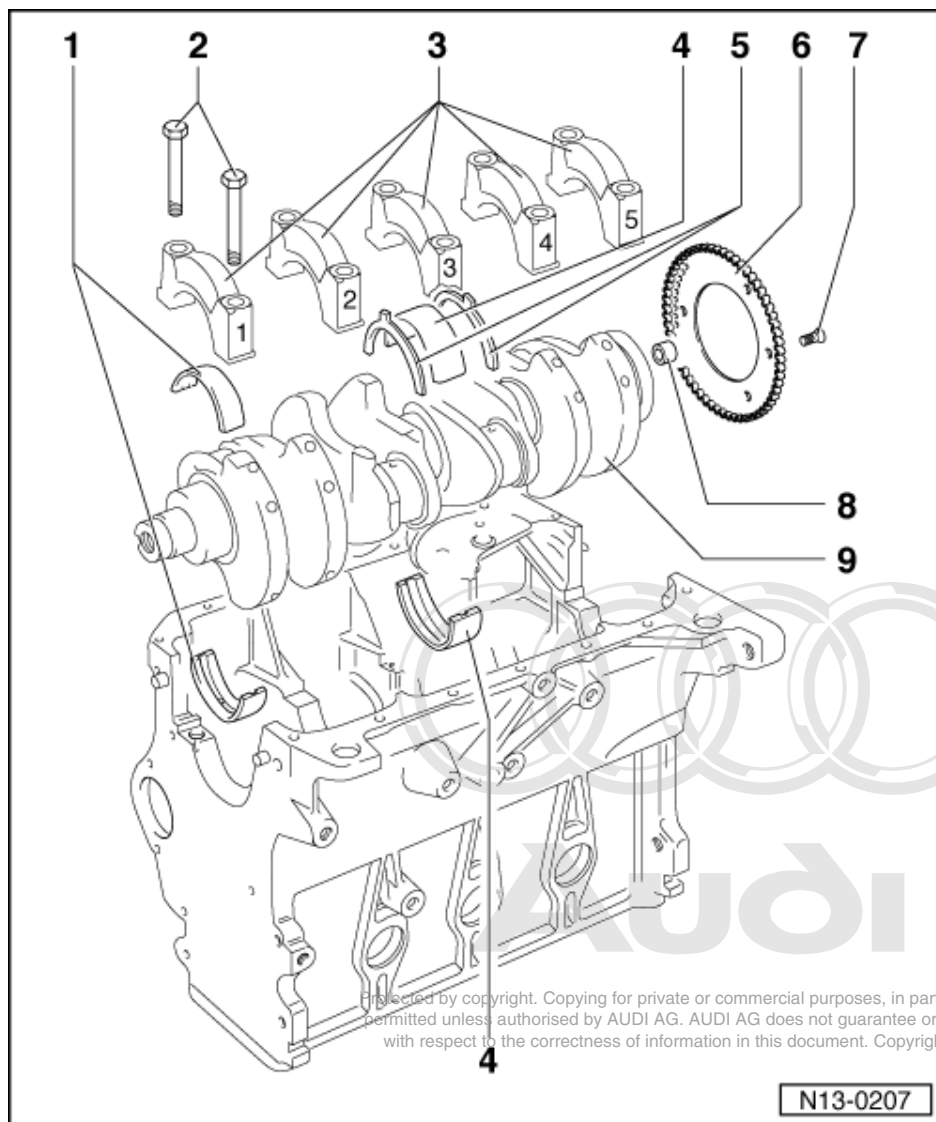
Component	Nm
Drive plate to crankshaft	60 + 90°(1/4 turn)

1) 90°= 1/4turn

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3 - Removing and installing crankshaft

3.1 - Removing and installing crankshaft



Note:

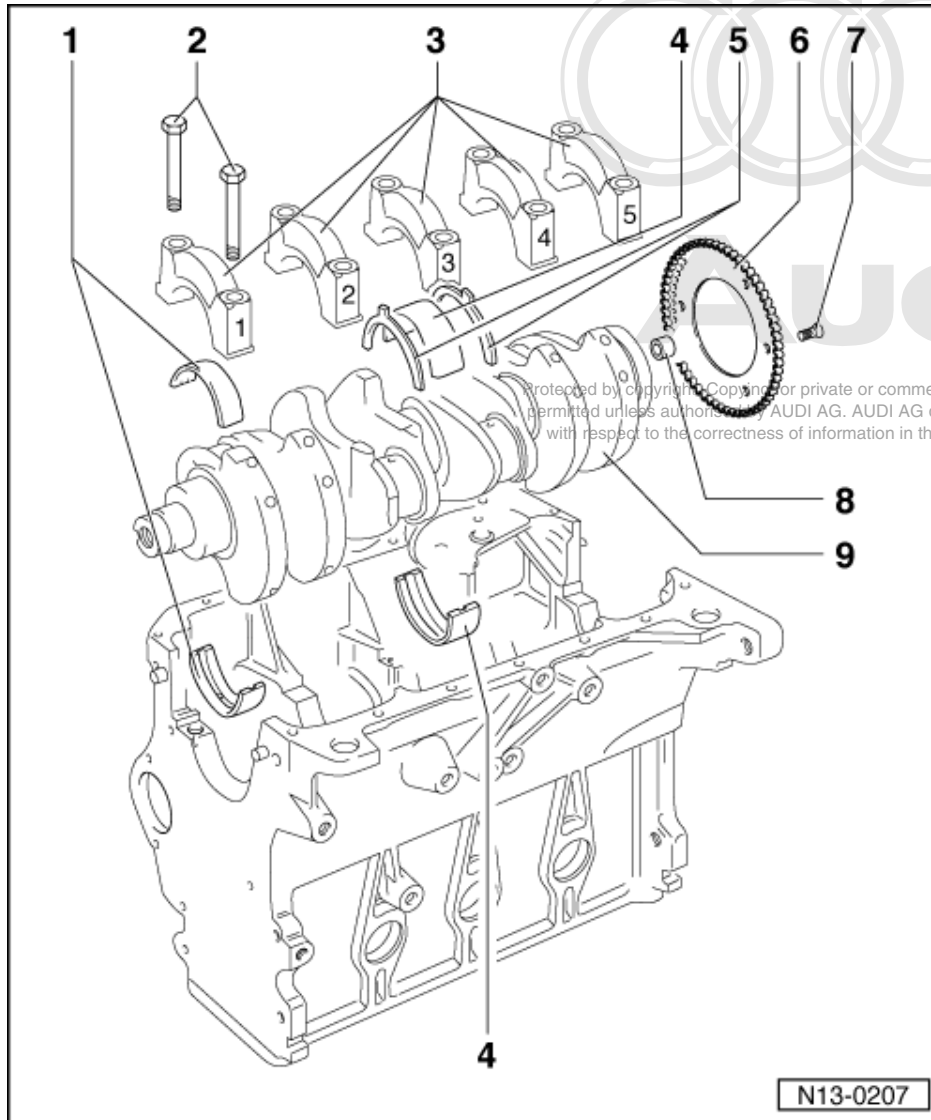
Secure engine to engine bracket VW 540 on assembly stand when dismantling/assembling engine.

1 Bearing shells 1, 2, 4 and 5

- ◆ For bearing cap without oil groove
- ◆ For cylinder block with oil groove
- ◆ Do not interchange used bearing shells (mark)

2 65 Nm + 1/4turn (90 °) further

- ◆ Renewing
- ◆ When measuring radial clearance of crankshaft, tighten to 65 Nm but do not turn further



3 Bearing cap

- ◆ Bearing cap 1: Pulley end
- ◆ Bearing shell retaining lugs cylinder block/bearing cap must be on the same side

4 Bearing shell 3

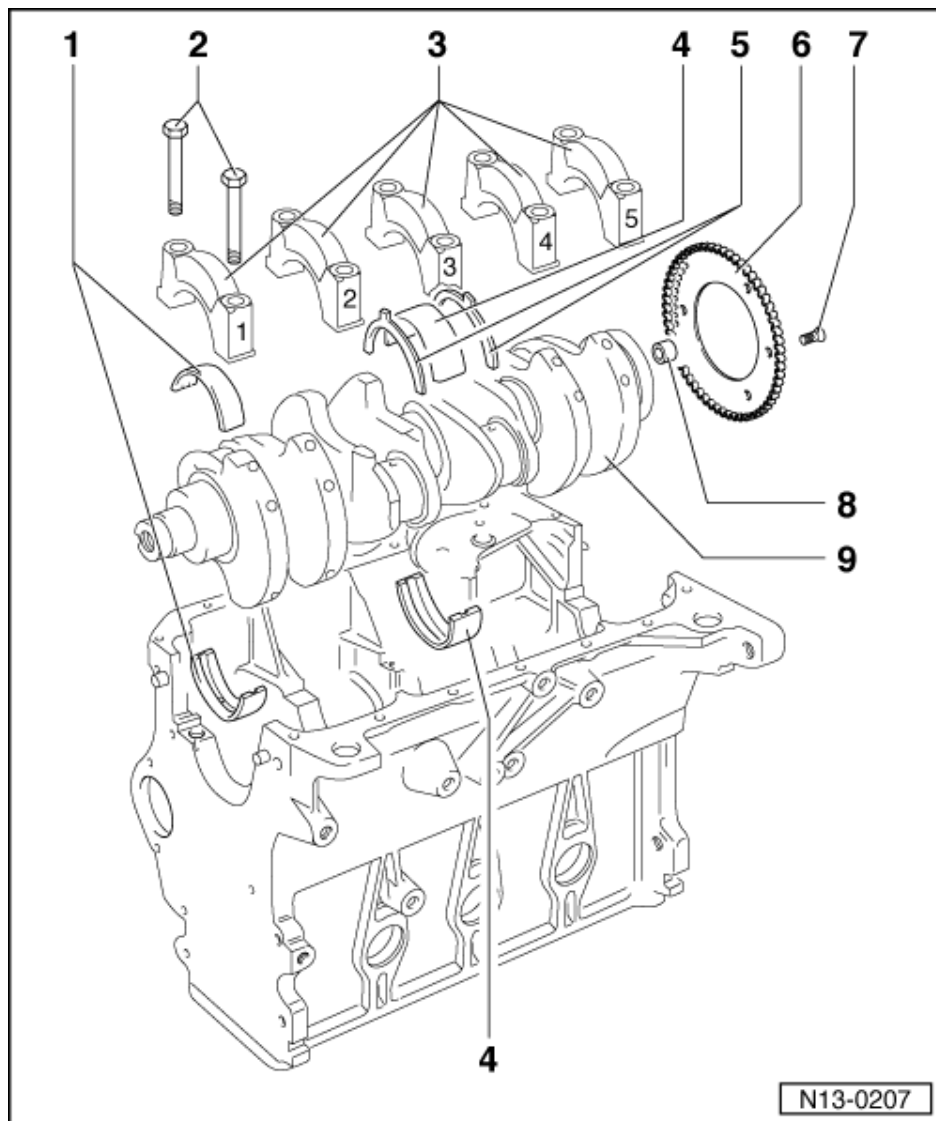
- ◆ For bearing cap without oil groove
- ◆ For cylinder block with oil groove
- ◆ Do not interchange used bearing shells (mark)

5 Thrust washers

- ◆ For bearing 3 bearing cap
- ◆ Note fixing arrangement

6 Sender wheel

- ◆ For engine speed sender -G28
- ◆ Can only be installed in one position. Holes are off-set
- ◆ Always renew sender wheel if securing bolts have been unscrewed
- ◆ Removing and installing
=> Fig. 1

**7 10 Nm + 1/4 turn (90 °) further**

- ♦ Renew
- ♦ Always renew sender wheel if securing bolts have been unscrewed

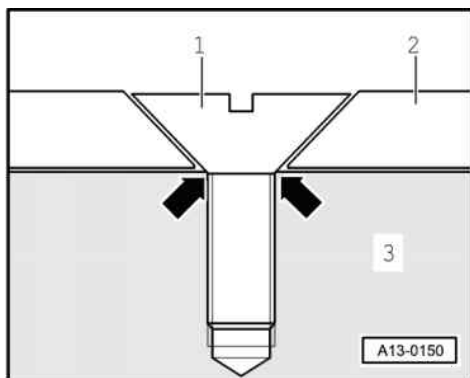
8 Needle bearing

- ♦ Pulling out and driving in
=> Page 71

9 Crankshaft

- ♦ Axial clearance new: 0.07...0.23 mm
Wear limit: 0.30 mm
- ♦ Check radial clearance with Plastigage
New: 0.02...0.04 mm
Wear limit: 0.15 mm
- ♦ Do not rotate the crankshaft when checking the radial clearance
- ♦ Crankshaft dimensions
=> Page 72

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-> Fig.1 Removing and installing sender wheel

- Always renew sender wheel -2- if securing bolts -1- have been unscrewed.

Notes:

- ♦ If the securing bolts are tightened a second time, the seats for the countersunk bolt heads in the sender wheel will be distorted to such an extent that the bolt heads will come into direct contact with the crankshaft -3- (-arrows-) and the sender wheel will only fit loosely under the bolts.
- ♦ The mounting holes are asymmetrically spaced, so it is only possible to install the sender wheel in one position.

Tightening torque

Component	Nm
Sender wheel to crankshaft	10 + 90° 1)2)

- 1) Renew bolts
- 2) 90° is a quarter turn

3.2 - Removing and installing needle bearing in crankshaft

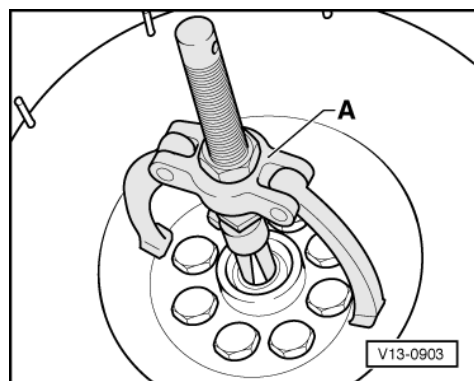
Notes:

- ♦ A needle bearing must be fitted in the crankshaft on vehicles with manual gearbox. Install needle bearing if necessary.
- ♦ The needle bearing must not be fitted in the crankshaft on vehicles with automatic gearbox. Remove needle bearing if necessary.

Special tools, testers and auxiliary items

- ♦ Kukko 21/2 and Kukko 22/1

or





- ♦ Puller 10-202
- ♦ Drift VW 207 C

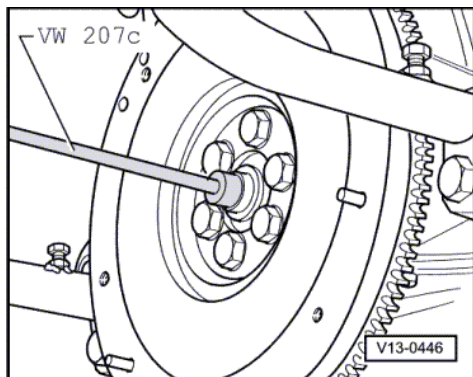
or

- ♦ Centralizing pin 3176

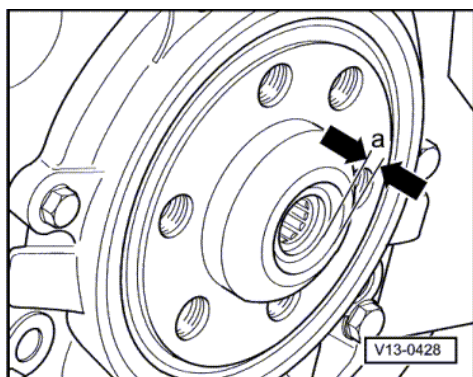
Removing

- -> Pull out with puller -A-, e.g. Kukko 21/2 and Kukko 22/1 or 10-202.

Installing



- -> Knock in with drift 207c or centring mandrel 3176.
- Lettering on needle bearing must be visible when installed.



-> Installation depth for needle bearing

- ♦ Distance a = 1.5 mm

3.3 - Crankshaft dimensions

(in mm)

Honing dimension	Main journal diameter	Conrod journal diameter
Basic dimension	-0.017 54.00 -0.037	-0.022 47.80 -0.042



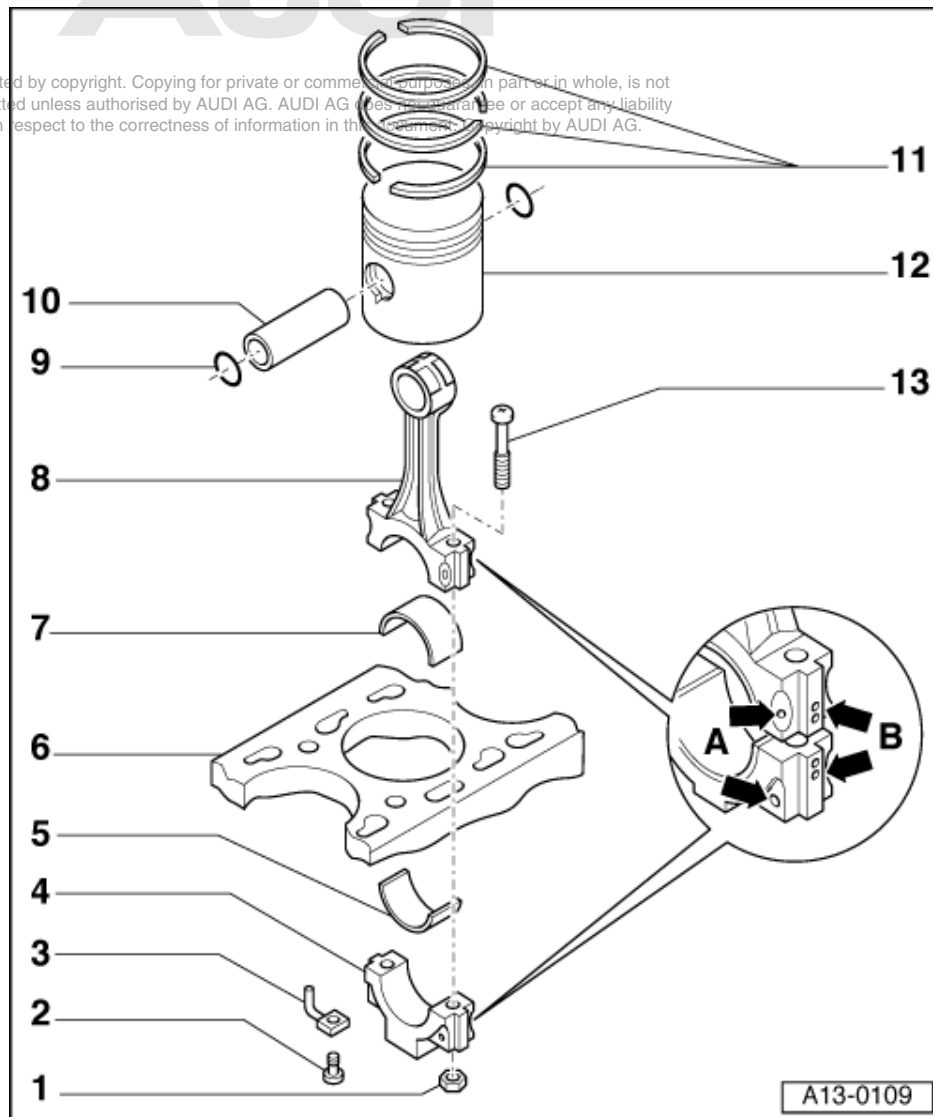
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Honing dimension	Main journal diameter	Conrod journal diameter
1st undersize	-0.017 53.75 -0.037	-0.022 47.55 -0.042
2nd undersize	-0.017 53.50 -0.037	-0.022 47.30 -0.042
3rd undersize	-0.017 53.25 -0.037	-0.022 47.05 -0.042

4 - Dismantling and assembling pistons and conrods

4.1 - Dismantling and assembling pistons and conrods

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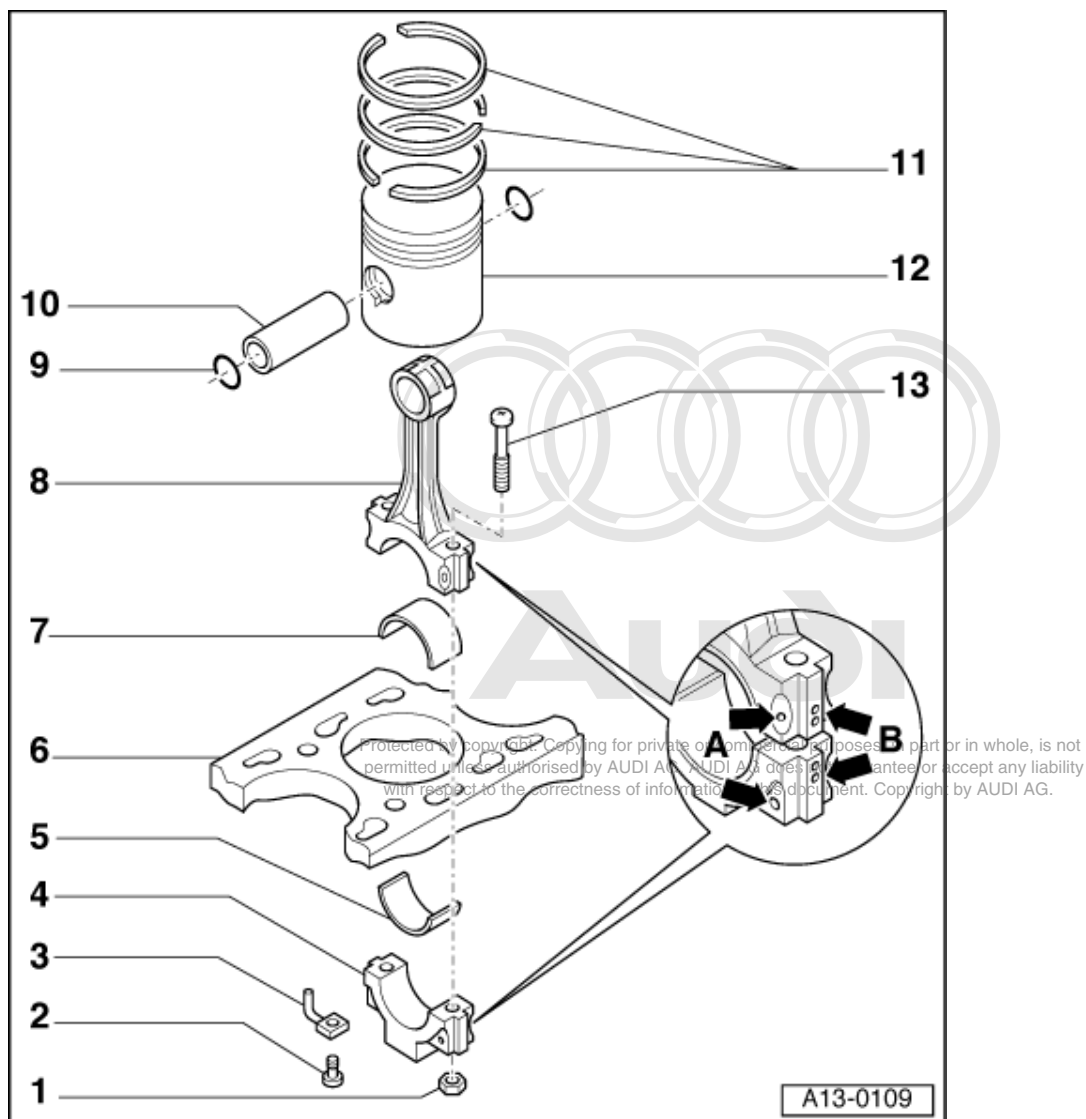


- 1 30 Nm +1/4turn (90°) further
 - ◆ Renew conrod bolts (Item **13**)
 - ◆ Oil threads and contact surface
 - ◆ To measure radial clearance tighten to 30 Nm but not further
- 2 Pressure relief valve, 27 Nm

- ♦ opens at:
2.5 ... 3.2 bar

3 Oil spray jet

- ♦ For piston cooling

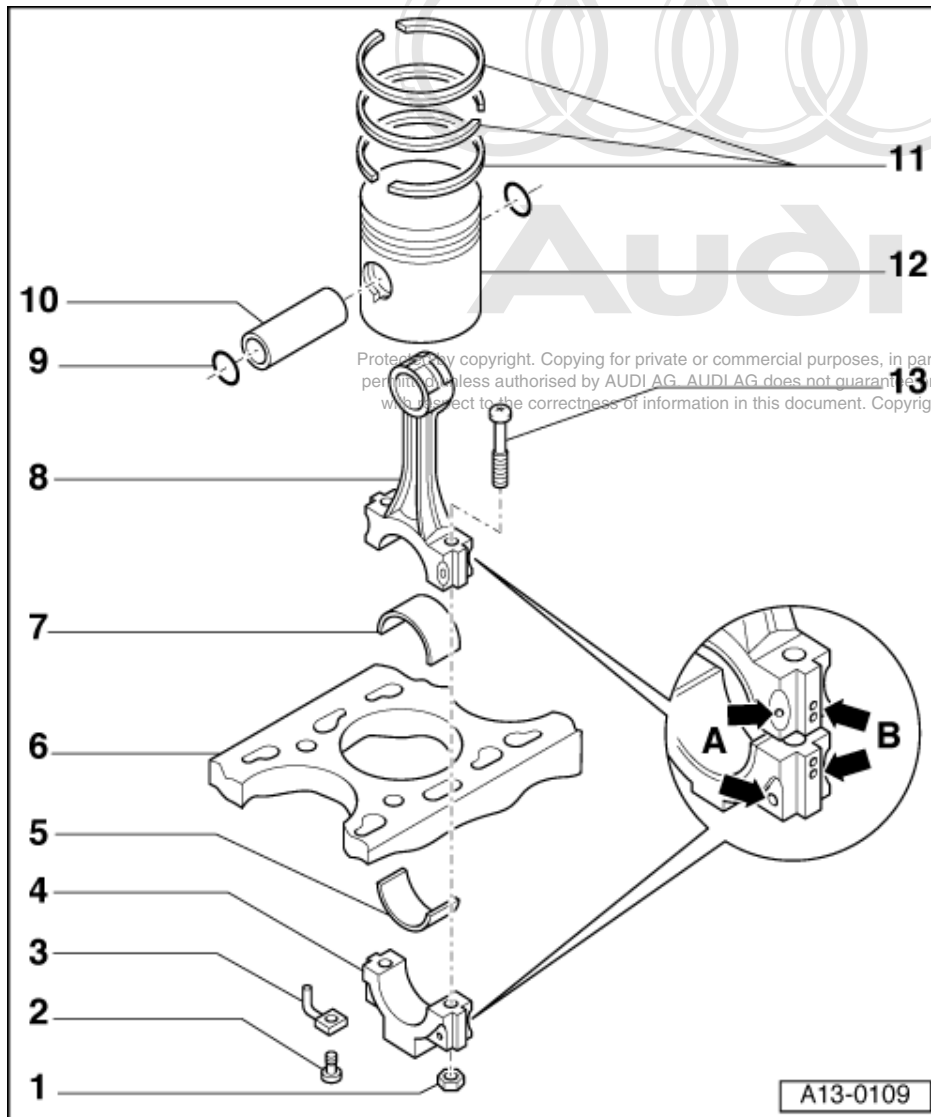


4 Conrod bearing cap

- ♦ Mark cylinder number -B-
- ♦ Installation position:
Marking -A- faces towards pulley end

5 Bearing shell

- ♦ Note installation position
- ♦ Do not interchange used bearing shells (mark)
- ♦ Ensure retaining lugs fit tightly in recesses
- ♦ Axial clearance
New: 0.10...0.35 mm
Wear limit: 0.40 mm
- ♦ Check radial clearance with Plastigage:
New: 0.01...0.05 mm
Wear limit: 0.12 mm
Do not rotate crankshaft when checking radial clearance
- ♦ To measure radial clearance, tighten nuts -Item 1 - to 30 Nm but do not turn further

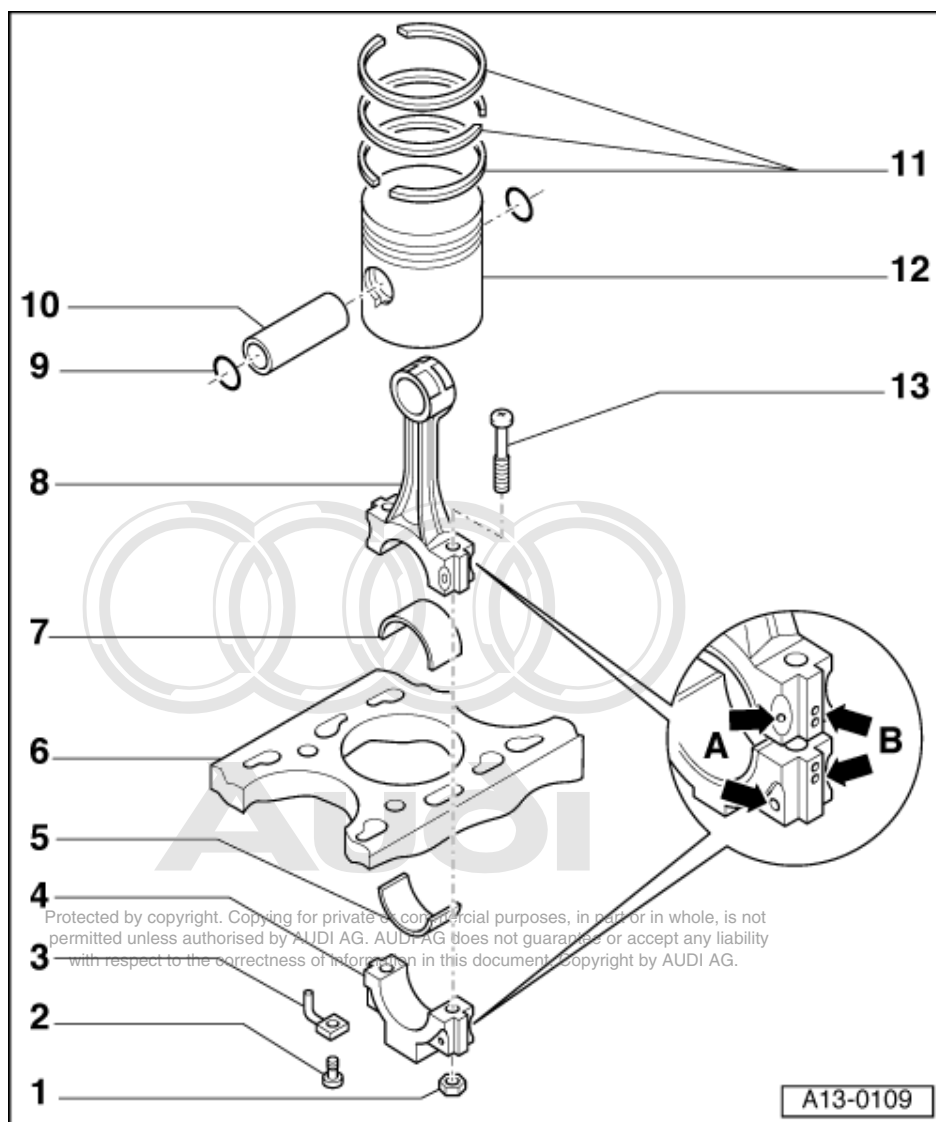


6 Cylinder block

- ♦ Checking cylinder bores
=>Fig. 4
- ♦ Piston and cylinder dimensions
=>Page 79

7 Bearing shell

- ♦ With oil drilling for piston pin lubrication
- ♦ Note installation position
- ♦ Do not interchange used bearing shells (mark)
- ♦ Axial clearance
New: 0.10...0.35 mm
Wear limit: 0.40 mm
- ♦ Check radial clearance with Plastigage:
New: 0.01...0.05 mm
Wear limit: 0.12 mm
Do not rotate crankshaft when checking radial clearance
- ♦ To measure radial clearance, tighten nuts -Item 1 - to 30 Nm but do not turn further



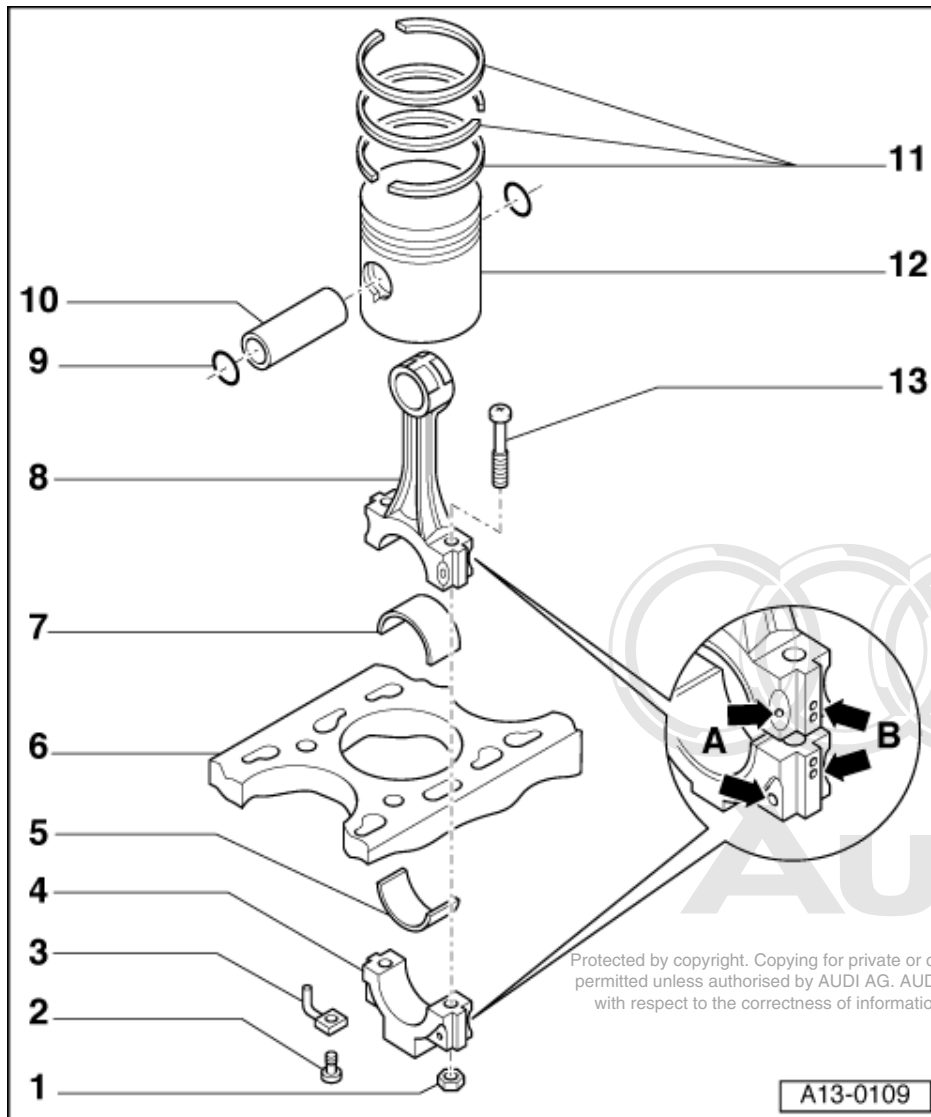
8 Conrod

- ◆ Only renew as a set
- ◆ Mark cylinder number -B-
- ◆ Installation position:
Marking -A- faces towards pulley end
- ◆ With oil drilling for piston pin lubrication

9 Circlip

10 Piston pin

- ◆ If difficult to move, heat piston to approx. 60 °C
- ◆ Remove and install with VW 222a



11 Piston ring

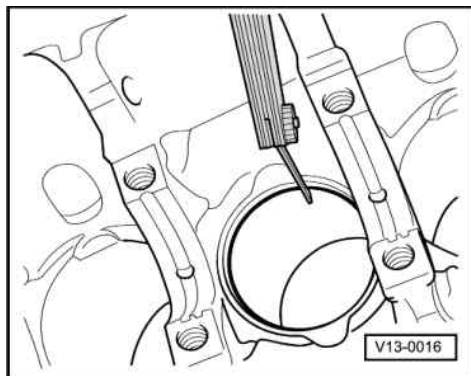
- ◆ Offset gaps by 120 °
- ◆ Remove and install with piston ring pliers
- ◆ "TOP" must face towards piston crown
- ◆ Checking ring gap=> Fig. 1
- ◆ Checking ring to groove clearance
=> Fig. 2

12 Piston

- ◆ Checking => Fig. 3
- ◆ Mark installation position and cylinder number
- ◆ Arrow on piston crown points to pulley end
- ◆ Install using piston ring clamp

13 Conrod bolt

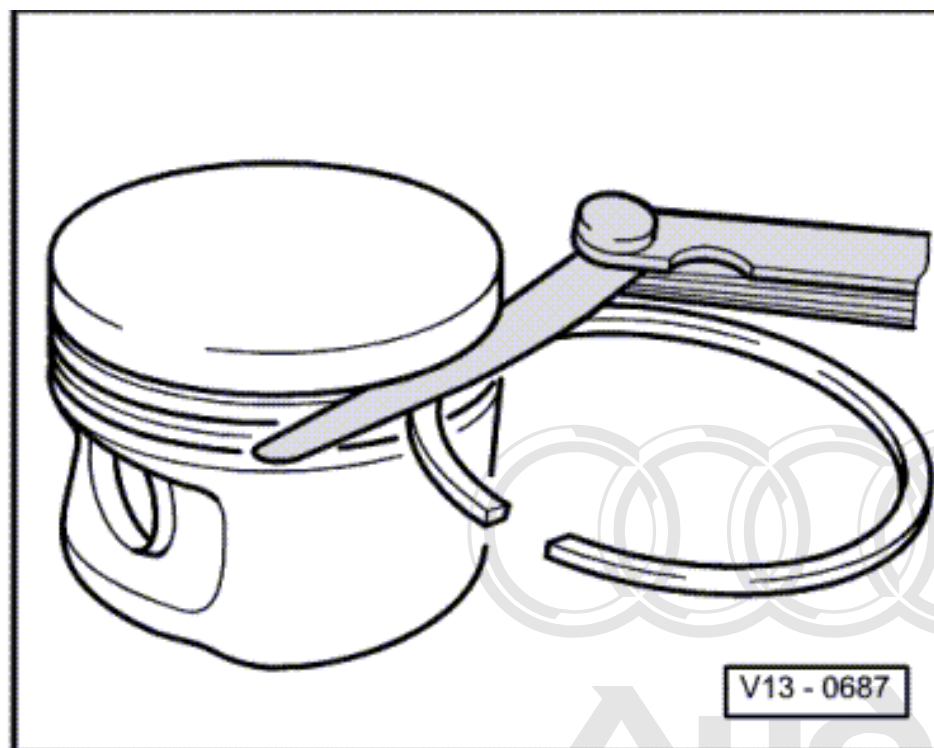
- ◆ Renew



-> Fig. 1 Checking piston ring gap

- Push ring squarely from above down to approx. 15 mm from bottom end of cylinder.

Piston ring Dimensions in mm	New	Wear limit
1st compression ring	0.20...0.40	0.8
2nd compression ring	0.20...0.40	0.8
Oil scraper ring	0.25...0.50	0.8

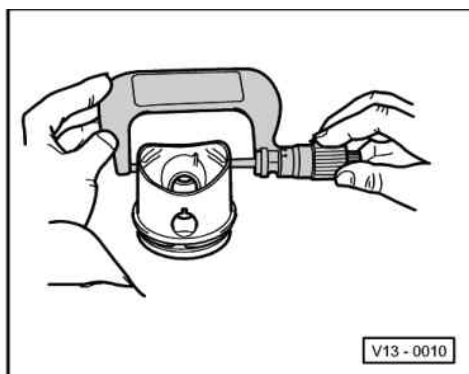


-> Fig. 2 Checking ring to groove clearance

- Clean groove before checking clearance.

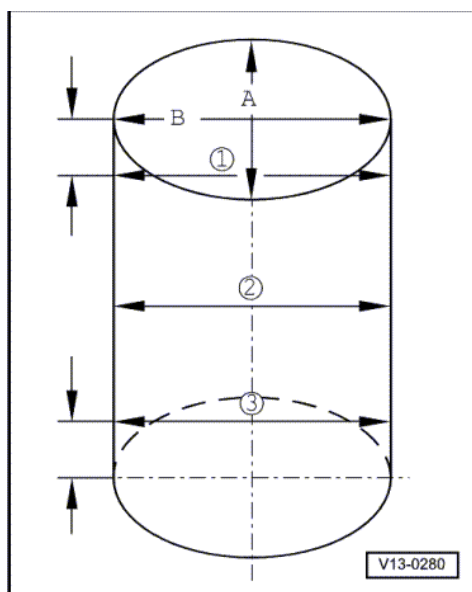
Piston ring Dimensions in mm	New	Wear limit
1st compression ring	0.06...0.09	0.20
2nd compression ring	0.05...0.08	0.20

Piston ring Dimensions in mm	New	Wear limit
Oil scraper ring	0.03...0.06	0.15



-> Fig. 3 Checking piston

- Measure pistons approx. 10 mm from lower edge of skirt, at 90° to the piston pin axis.
 - Deviation from nominal dimension not more than 0.04 mm



-> Fig. 4 Checking cylinder bores

- Use internal dial gauge 50 ... 100 mm.
- Take measurements at 3 positions in both lateral -A- and longitudinal -B- directions.
 - Deviation from nominal dimension not more than 0.08 mm



4.2 - Piston and cylinder dimensions

	Piston diameter	Cylinder bore
Basic dimen. mm	80.9751)	81.01



		Piston diameter	Cylinder bore
Oversize	mm	81.475 1)	81.51

- 1) Dimension without graphite coating (thickness 0.02 mm).
The graphite coating wears away.



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15 - Cylinder head, Valve gear

1 - Removing and installing cylinder head

1.1 - Removing and installing cylinder head

Notes:

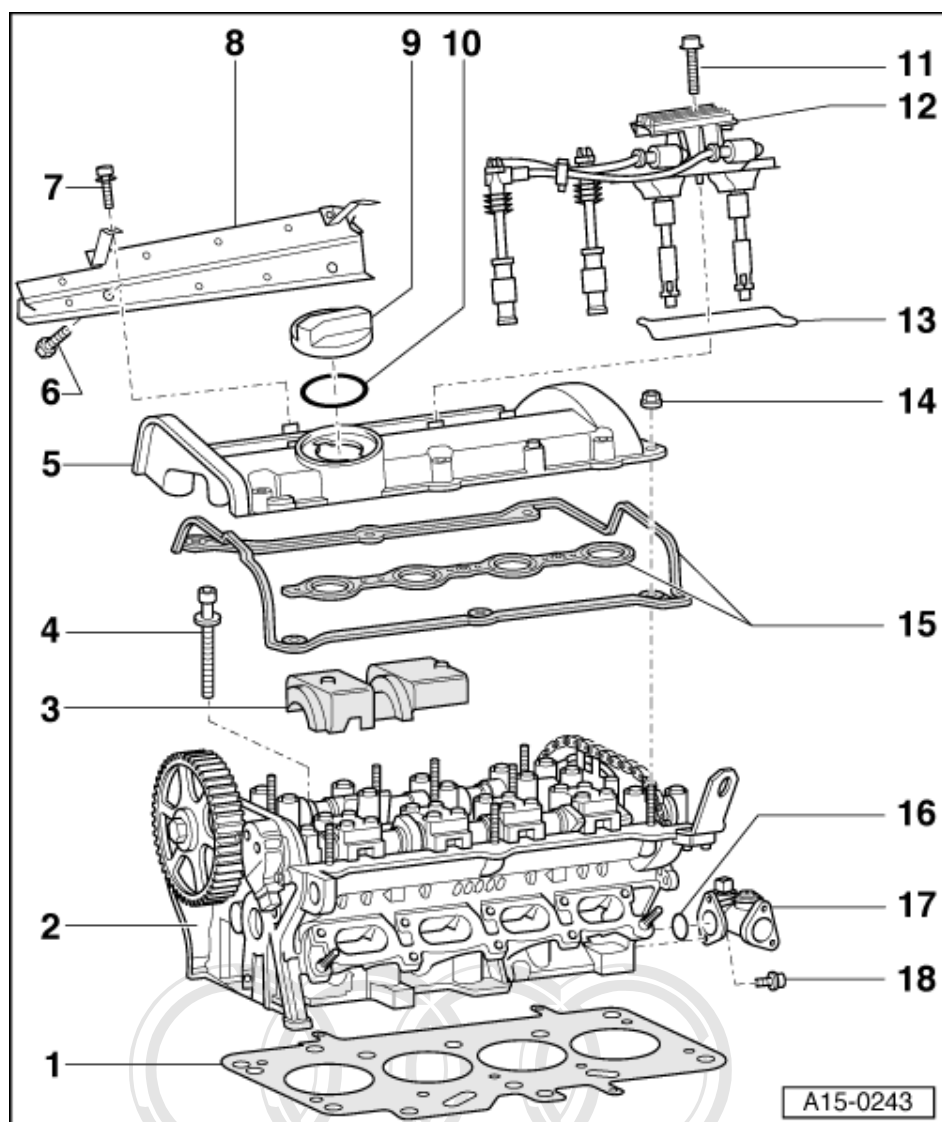
- ◆ Renew the cylinder head bolts.
- ◆ When performing repairs, renew seals, gaskets, self-locking nuts and bolts which have a specified tightening angle.
- ◆ When installing an exchange cylinder head with the camshafts fitted, the contact surfaces between bucket tappet and cam running surface must be oiled after installation of the cylinder head.
- ◆ The plastic protectors fitted to protect the open valves must only be removed immediately before fitting the cylinder head.
- ◆ When fitting a new cylinder head or cylinder head gasket, drain off all the old coolant and re-fill with new coolant.
- ◆ Cylinder heads which have cracks between the valve seats or between valve seat inserts and the spark plug thread can be used further without reducing service life, provided the cracks do not exceed a maximum of 0.3 mm in width, or when no more than the first 4 turns of the spark plug threads are cracked.



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1.2 - Part I

**1 Cylinder head gasket**

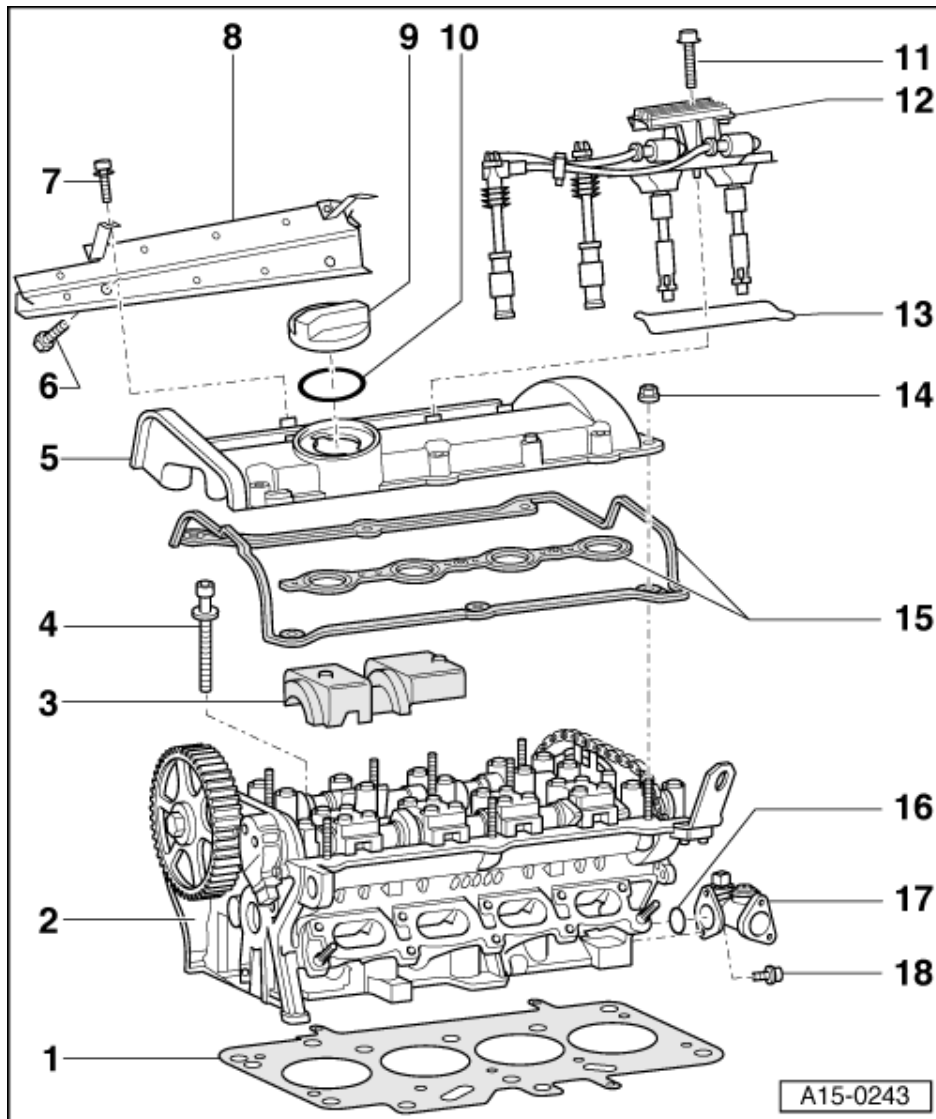
- ◆ Renew => Removing cylinder head, Page 96
- ◆ Position: Part No. towards cylinder head
- ◆ After replacing, fill with fresh coolant

2 Cylinder head

- ◆ Removing => Page 96
- ◆ Check for distortion => Fig. 1
- ◆ Reworking limit => Fig. 2
- ◆ Installing => Page 99
- ◆ After replacing, fill with fresh coolant

3 Oil deflector

- ◆ Note installation position:
Above inlet camshaft between No. 1 and No. 2 cylinders



4 Cylinder head bolt

- ♦ Renew
- ♦ Note sequence when loosening
=> Page 99
- ♦ Note sequence when tightening
=> Page 100

5 Cylinder head cover

- ♦ Removing and installing
=> Page 94

6 20 Nm

7 10 Nm

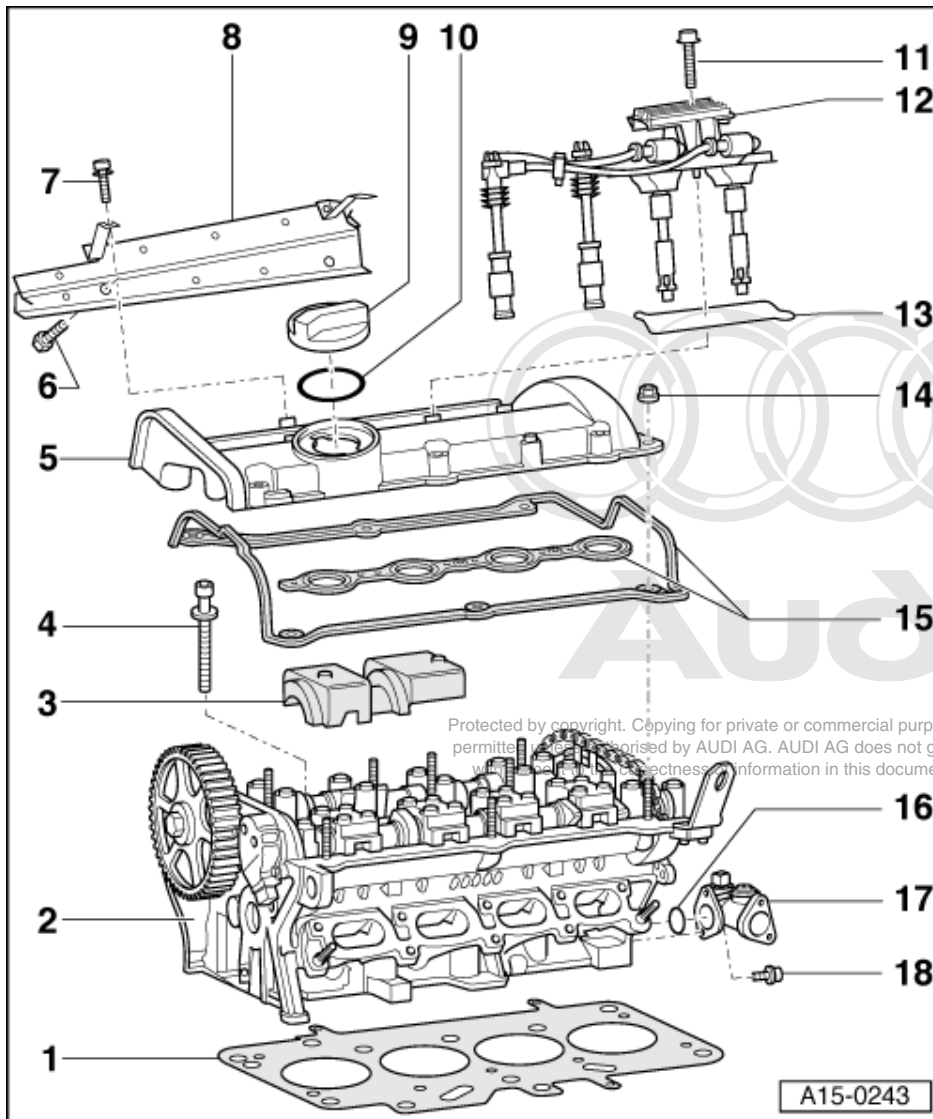
8 Heat shield

9 Sealing cap

10 Gasket

- ♦ Renew if damaged or leaking

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11 10 Nm

12 Ignition coil

- ◆ With output stage and spark plug connectors
- ◆ Testing

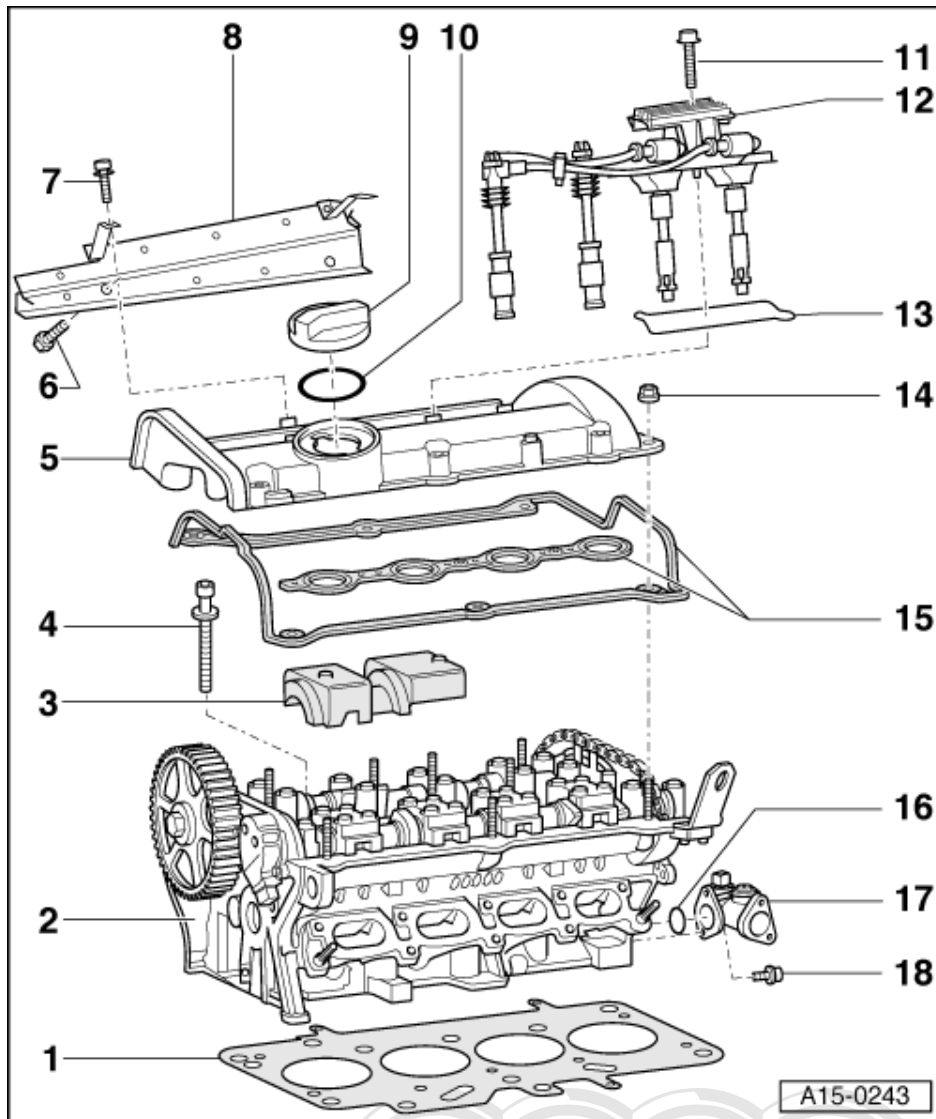
=> Motronic injection and ignition system (4-cylinder); Repair group 28; Testing dual-spark ignition system with two ignition coils (ADR engine) Testing dual-spark ignition system with two ignition coils (ADR engine)

=> Motronic injection and ignition system (4-cylinder) 07.96 ä; Repair group 28; Testing ignition system; Testing dual-spark ignition system with two ignition coils Testing ignition system Testing dual-spark ignition system with two ignition coils

13 Gasket

- ◆ For ignition coil
- ◆ Renew if damaged

14 10 Nm



15 Cylinder head cover gaskets

- ♦ Renew if damaged or leaking
- ♦ Before fitting gasket apply "D 454 300 A2" at sealing points shown in Fig. 3 and Fig. 4

16 O ring

- ♦ Renew

17 Coolant flange

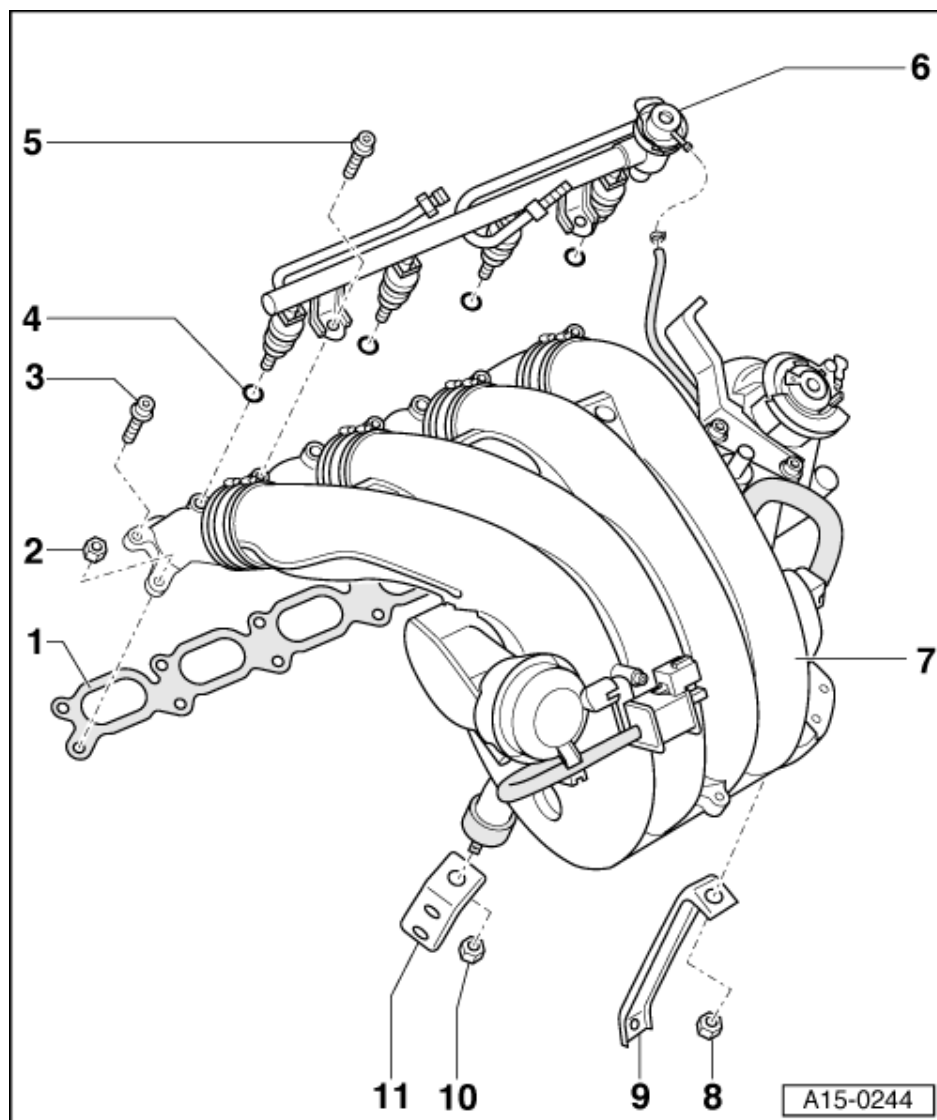
- ♦ With coolant temperature sender

18 10 Nm

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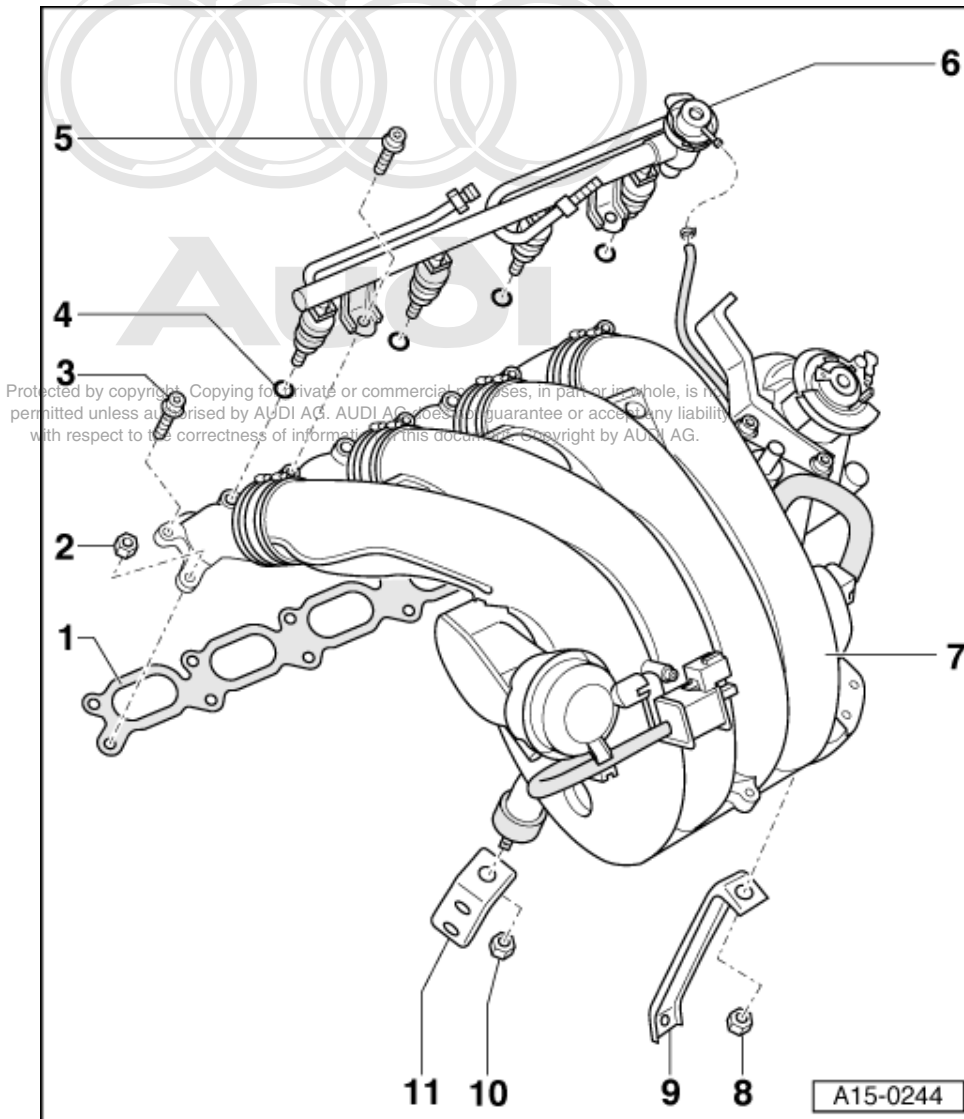
1.3 - Part II



- 1 Gasket
 - ◆ Renew
- 2 10 Nm
- 3 10 Nm
- 4 O ring
 - ◆ For injector
 - ◆ Renew
- 5 10 Nm
- 6 Fuel distributor rail
 - ◆ With injectors



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7 Intake manifold

- ♦ Removing and installing
=> Page **89**
- ♦ Vehicles 08.97 ä: intake manifold with change-over function
- ♦ Checking intake manifold change-over function:

=> Motronic injection and ignition system (4-cylinder 07.96 ä); Repair group 24; Checking intake manifold change-over function

8 25 Nm

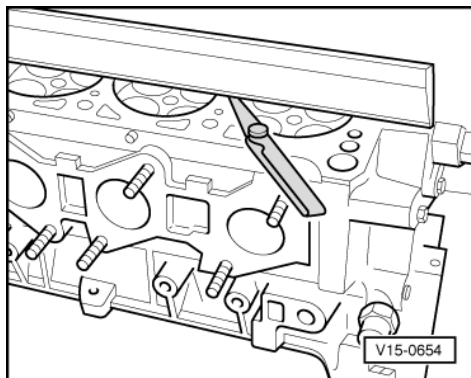
9 Support

- ♦ For intake manifold

10 25 Nm

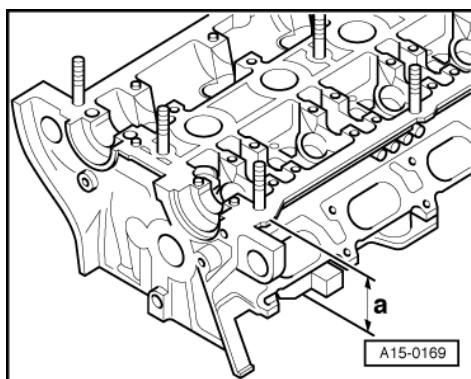
11 Support

- ♦ For intake manifold



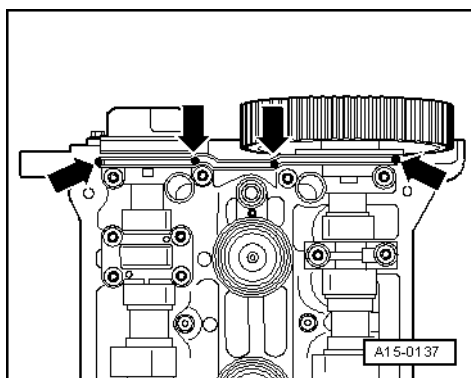
-> Fig. 1 Checking cylinder head for distortion

- Use knife-edge straightedge and feeler gauge to measure at several points.
 - Max. permissible distortion: 0.1 mm



-> Fig.2 Cylinder head reworking limit

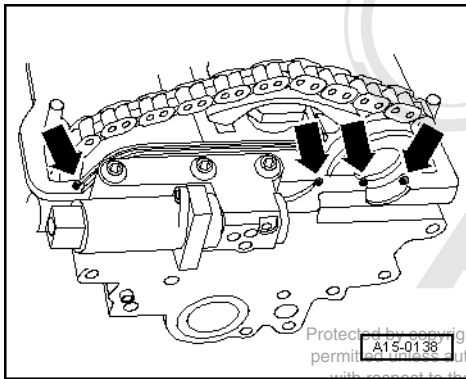
- Reworking the cylinder head (shaving) is only permitted down to minimum dimension a.
 - Minimum dimension a = 139.25 mm



-> Fig. 3 Sealing points between double bearing cap and cylinder head

- Carefully apply a small amount of sealant "D 454 300 A2" to both sides of sealing surfaces between double bearing cap and cylinder head -arrows- using a small screwdriver.

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-> Fig. 4 Sealing points: hydraulic chain tensioner / cylinder head or camshaft adjuster / cylinder head

- Carefully apply a small amount of sealant "D 454 300 A2" to both sides of sealing surfaces between hydraulic chain tensioner and cylinder head (or between camshaft adjuster and cylinder head) -arrows- using a small screwdriver.

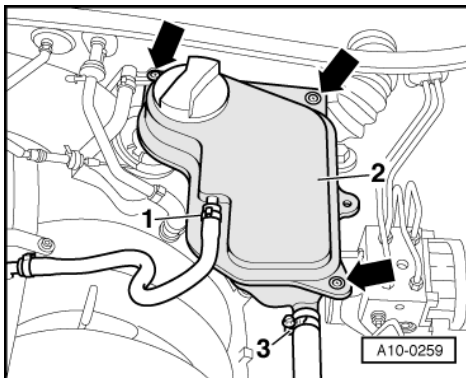
1.4 - Removing and installing intake manifold

Removing

Note:

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

- Obtain radio code on vehicles with coded radio.
- With ignition switched off disconnect battery earth strap.



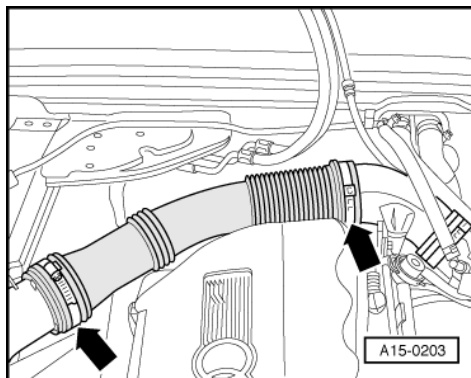
- -> Disconnect hose -1- going to upper coolant pipe.
- Unbolt coolant expansion tank -2- (-arrows-).
- Disconnect wire for coolant shortage indicator switch -F66 and move coolant expansion tank to one side.

Note:

Do not disconnect coolant hose -3-.

Vehicles with cruise control system

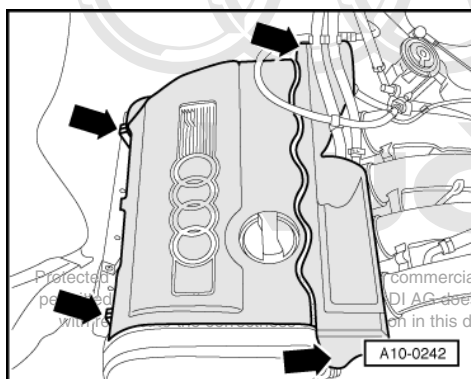
- Disengage actuator rod at throttle valve control part.



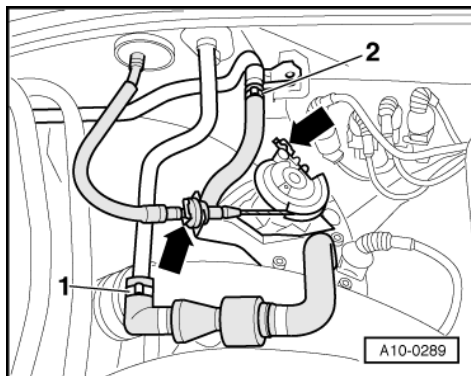
- Pull vacuum hose off vacuum unit.

All models

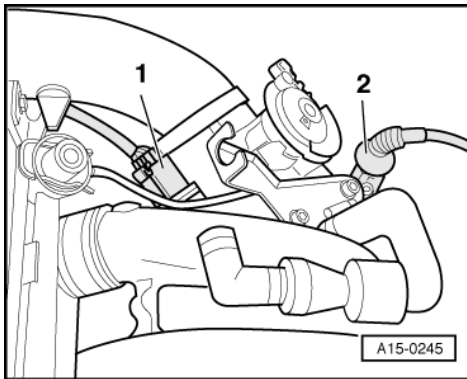
- -> Disconnect air intake hose at intake pipe connection and air mass meter -arrows-.



- -> Remove cover over injectors -arrows on right-.



- -> Detach throttle cable at the throttle valve control part and at support bracket (do not remove throttle cable retainer). Move throttle cable clear to the side.
- Disconnect vacuum hose -2- for ACF valve.
- Disconnect vacuum hose -1- for brake servo.

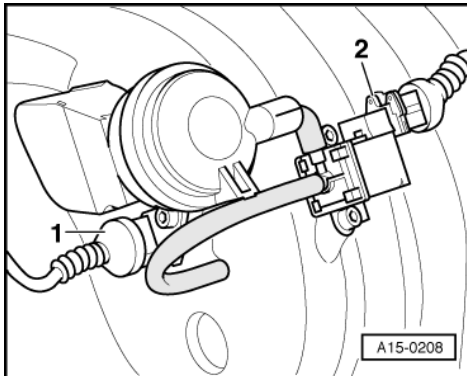


- -> Unplug connector -1- at throttle valve control part -J338.
- Move wiring clear.

Vehiclesä 07.97:

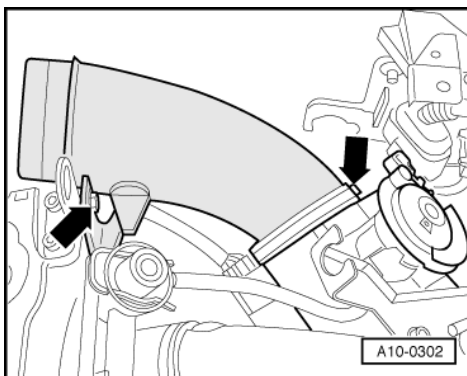
- Unplug connector -2- at intake air temperature sender -G42.

Vehicles08.97 ä:



- -> Disconnect wires/unplug connectors as follows:
 - 1 - intake air temperature sender -G42
 - 2 - Intake manifold change-over valve -N156

All models



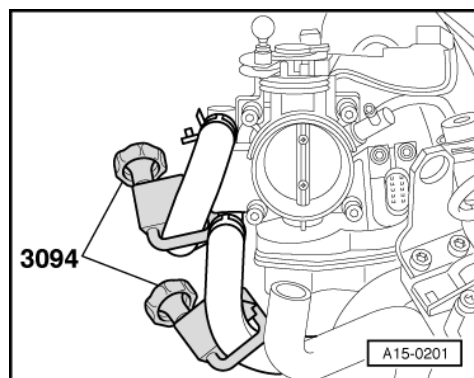
- -> Remove intake air pipe -arrows-.



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Note:

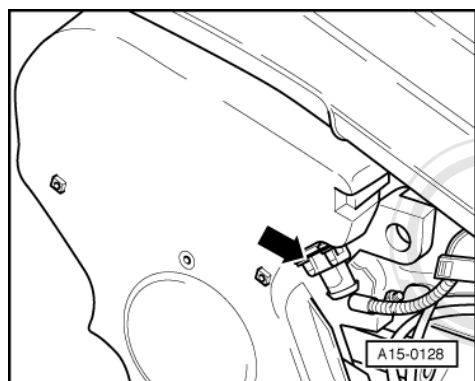
Detach hoses under intake air pipe after removing pipe.



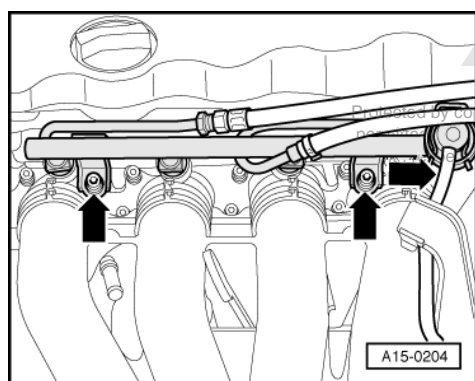
- -> Fit hose clamps 3094 on coolant hoses going to throttle valve control part.
- Disconnect coolant hoses from throttle valve control part.

Note:

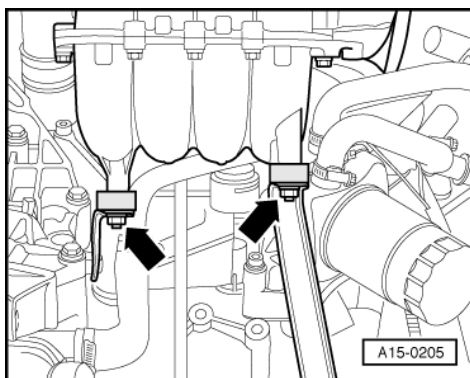
Throttle valve control part is shown in illustration with engine removed.



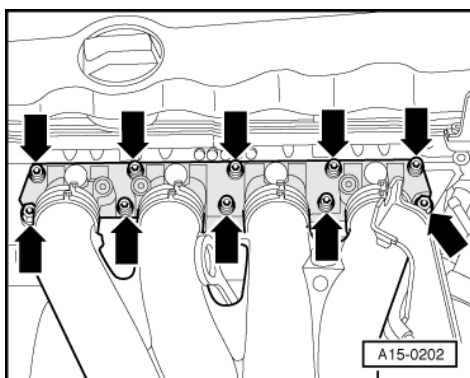
- -> Pull connector off Hall sender -G40 -arrow-.



- -> Unscrew retaining bolts for fuel distributor rail and disconnect vacuum line from fuel pressure regulator - arrows-.
- Pull fuel distributor rail together with injectors off intake manifold and place it on a clean cloth at the back of the engine compartment.



- -> Unbolt intake manifold from the two bottom supports -arrows-.



- -> Unbolt intake manifold from cylinder head -arrows- and remove.

Note:

Plug intake ports on cylinder head with clean cloths.

Installing

Installation is carried out in the reverse order, when doing this note the following:

Note:

Replace gaskets and seals.

- Adjust throttle cable => Page 222
- Fill cooling system => Page 159
- After connecting battery, enter anti-theft code for radio

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch function.
- Set clock to correct time.
- Perform adaption of throttle valve control part:

=> Motronic injection and ignition system (4-cylinder); Repair Group 24; Checking throttle valve control part -J338; Performing basic setting of throttle valve control part -J338 Checking throttle valve control part -J338 Performing basic setting of throttle valve control part -J338

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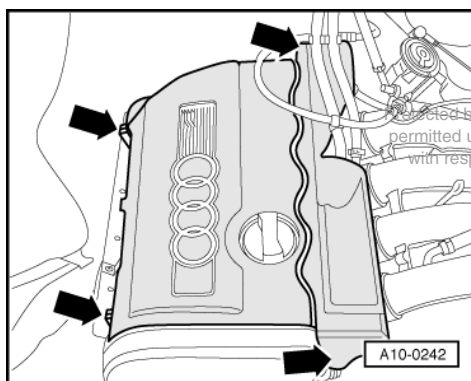
=> Motronic injection and ignition system (4-cylinder) 07.96 ä; Repair group 24; Testing throttle valve control part; Performing adaptation of throttle valve control part Testing throttle valve control part Performing adaptation of throttle valve control part

Tightening torques

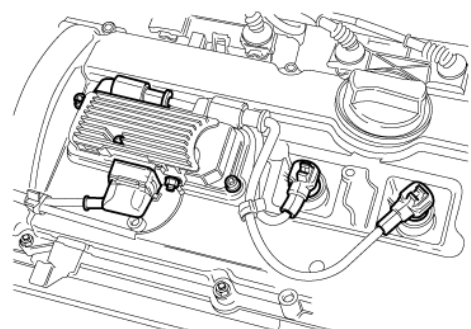
Component	Nm	
Intake manifold to cylinder head	10	
Intake manifold support	to intake manifold	20
	to bracket	20
	to sump	20
Fuel distributor rail to intake manifold	10	

1.5 - Removing and installing cylinder head cover

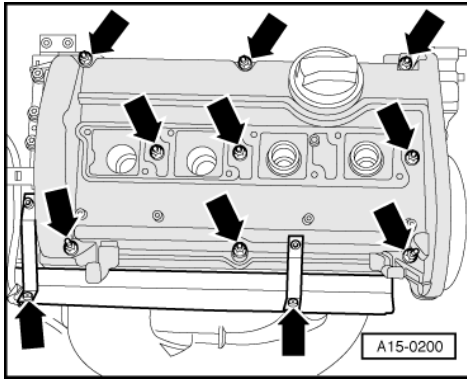
Removing



- -> Remove engine cover panels -arrows-.

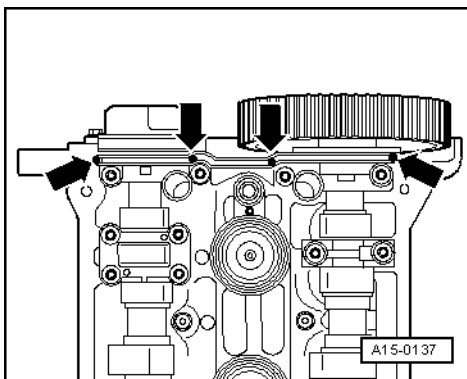


- -> With ignition switched off, unscrew and unclip connector and earth wire from ignition coil with output stage -arrows-.
- Unbolt ignition coil and detach together with the two spark plug connectors.
- Remove toothed belt guard (upper) => Page 42 .



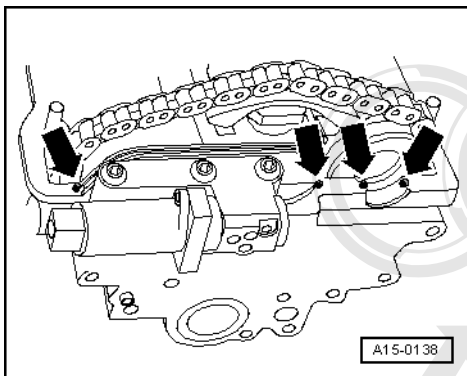
- -> Loosen nuts and bolts -arrows- on cylinder head cover and remove cylinder head cover.

Installing



Installation is carried out in the reverse order, when doing this note the following:

- -> Carefully apply a small amount of sealant "D 454 300 A2" to both sides of sealing surfaces between double bearing cap and cylinder head -arrows- using a small screwdriver.



- Carefully apply a small amount of sealant "D 454 300 A2" to both sides of sealing surfaces between hydraulic chain tensioner and cylinder head (or between camshaft adjuster and cylinder head) -arrows- using a small screwdriver.

Note:

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Replace gasket if damaged.

- Tighten nuts for cylinder head cover in diagonal sequence.



Tightening torques

Component	Nm
Cylinder head cover to cylinder head	10
Ignition coil with output stage to cylinder head cover	10

1.6 - Removing cylinder head

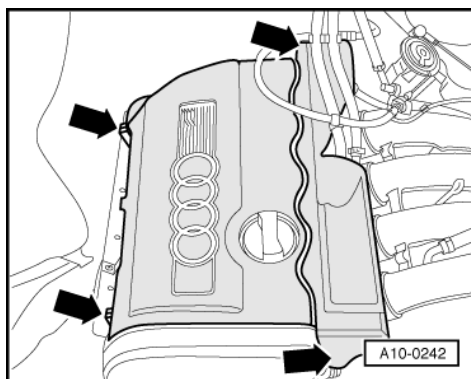
- Engine in vehicle
- Lock carrier must be in service position => Page 19 .

Notes:

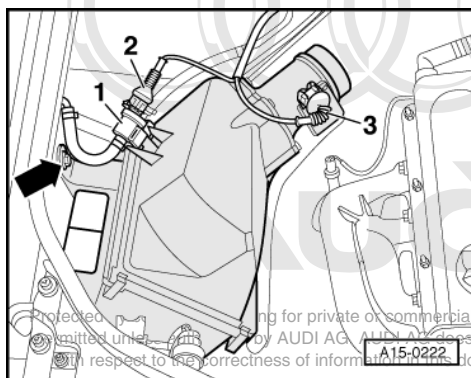
- ♦ Secure all hose connections with the correct hose clips (same as original equipment)

=> Parts catalogue

- ♦ All cable ties which are opened or cut open when removing must be replaced in the same position when installing.
- Obtain radio code on vehicles with coded radio.
- With ignition switched off disconnect battery earth strap.
- Draining cooling system=> Page 157
- Unscrew securing bolts for front exhaust pipe / exhaust manifold accessible from below .
- Remove intake manifold => Page 89 .
- Remove ribbed belt and ribbed belt tensioning element => Page 36 .

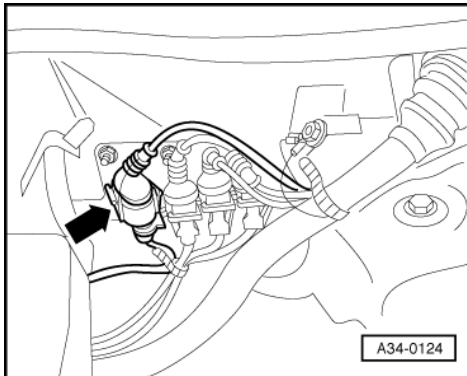


- -> Remove enginecover panels -arrows-.
- Takeoff cover above air cleaner housing.

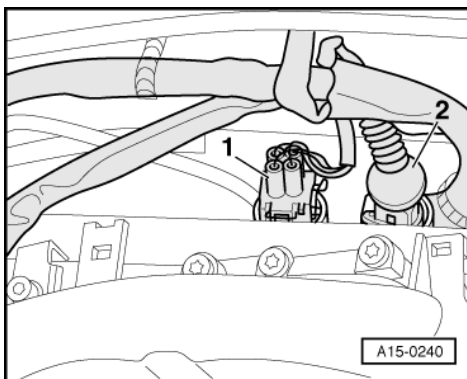


- -> Unplug connectors -2- and -3- at air mass meter and ACF valve, move wiring clear and place it on engine.
- Pull ACF valve -1- off air cleaner housing.
- Remove air cleaner housing -arrow-.
- Unscrew bolts accessible from above securing front exhaust pipe to exhaust manifold.

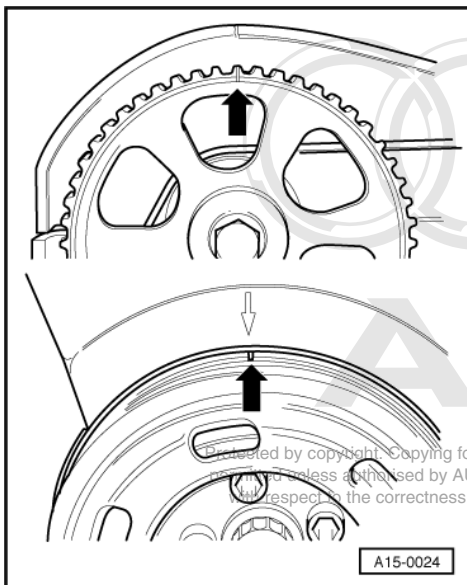
- Push exhaust system towards the rear so that studs on exhaust manifold are free.



- -> Disengage connector -arrow- for lambda probe from retainers, unplug connector and move wiring clear.



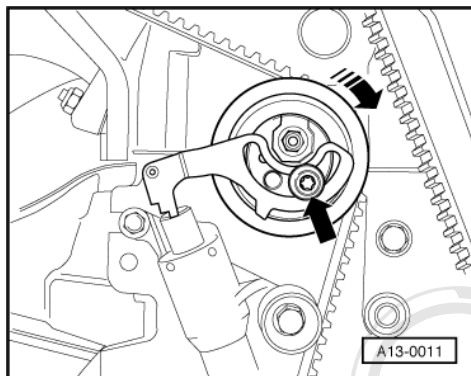
- -> Unplug connector -1- at coolant temperature sender -G2/-G62.
- Unplug connector -2- at temperature sensor -G18.
- Unclip all wiring from cylinder head and move clear to one side.
- Remove top coolant pipe=>Page 167 .



- Pull off coolant hose going to heat exchanger (heater unit) at back of cylinder head (first release retainers on connecting flange).
- Remove toothed belt guard (upper) => Page 42 .
- -> Set crankshaft to markings for TDC of No. 1 cylinder -arrows- by turning central bolt on crankshaft sprocket in direction of rotation.

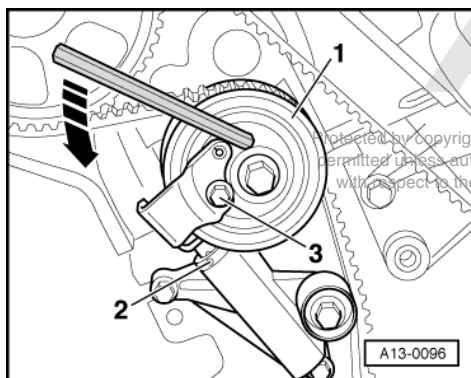


Vehicles 07.97:



- -> Loosen toothed belt tensioner with Torx wrench T45 -lower arrow-.
- Press toothed belt tensioner downwards.
- Take toothed belt off camshaft sprocket.
- Unscrew Torx bolt and pivot tensioner plate forwards.

Vehicles 08.97 ä:



- -> Using 8 mm hexagon key, turn toothed belt tensioning roller -1- slowly and with constant firm pressure in direction of arrow, so that holes -2- in tensioner piston and housing are aligned.

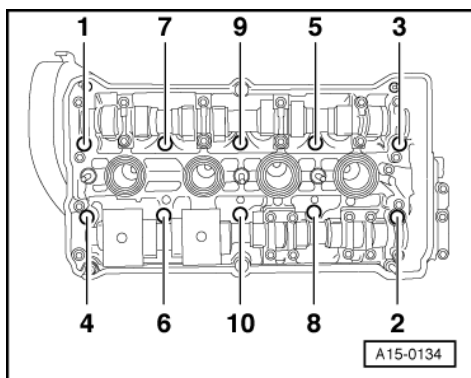
Note:

Do not loosen bolt -3-.

- With the tensioner in this position, insert a suitable retaining pin (such as a 2 mm drill bit or nail) into the two holes.
- Take toothed belt off camshaft sprocket.

All models

- Remove cylinder head cover=>Page 94 .

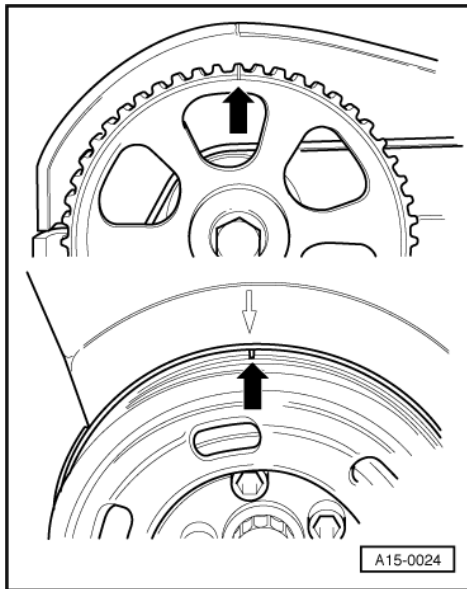


- -> Keep to specified sequence when loosening cylinder head bolts.
- Remove cylinder head.

1.7 - Installing cylinder head

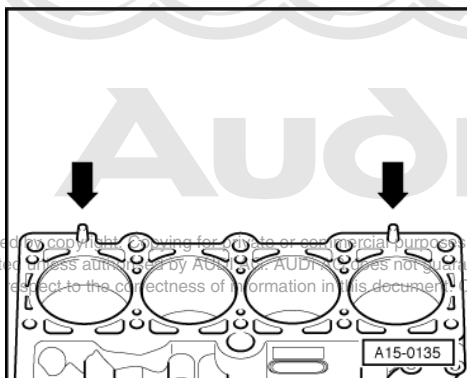
Notes:

- ◆ Always renew cylinder head bolts when assembling.
- ◆ When performing repairs, renew seals, gaskets, self-locking nuts and bolts which have a specified tightening angle.
- ◆ If repairing, carefully remove any remains of gasket material from the cylinder head and cylinder block. Make sure that no long scores or scratches are made on the surfaces.



- ◆ Carefully remove any remaining emery and abrasive material.
- ◆ Only remove new cylinder head gasket from packaging when ready for installation.
- ◆ Handle gasket extremely carefully. Damaging the silicone layer or the indented area will lead to leaks.
- ◆ No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.

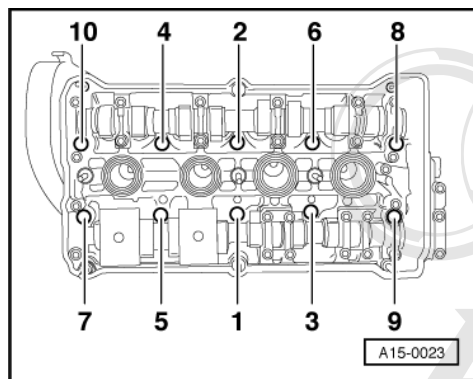
- -> Before positioning cylinder head, set crankshaft and camshaft to TDC of No. 1 cylinder.



- -> Place cylinder head gasket in position.
 - Note position of centralizing pins in cylinder block -arrows-.
 - Check installation position of cylinder head gasket, marking: spare parts no. must be legible from inlet side.
- Place cylinder head in position.



- Insert cylinder head bolts and tighten by hand.



- -> Tighten cylinder head bolts in two stages in sequence shown as follows:
- Stage 1: 60 Nm
- Stage 2: Torque a further 180 ° (1/2 turn) with a rigid wrench. It is permissible to torque by 2 x 90 °.

Note:

It is not necessary to re-tighten cylinder head bolts after repairs have been performed.

- Install cylinder head cover=>Page 95 .
- Install toothed belt (adjust valve timing)=>Page 56 .

Note:

Follow all instructions for removing and installing toothed belt =>Page 46 .

- Install ribbed belt and ribbed belt tensioning element=>Page 37 .
- Install top coolant pipe=>Page 167 .
- Install intake manifold=>Page 93 .
- Adjust throttle cable => Page 222
- Fill cooling system with fresh coolant => Page 159 .
- After connecting battery, enter anti-theft code for radio

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch function.
- Set clock to correct time.

- Perform adaption of throttle valve control part:

=> Motronic injection and ignition system (4-cylinder); Repair Group 24; Checking throttle valve control part - J338; Performing basic setting of throttle valve control part -J338 Checking throttle valve control part -J338 Performing basic setting of throttle valve control part -J338

=> Motronic injection and ignition system (4-cylinder)07.96 ä;Repair group 24; Testing throttle valve control part; Adapting throttle valve control part to engine control unit Testing throttle valve control part Adapting throttle valve control part to engine control unit

Tightening torques

Component	Nm
Support for intake manifold to intake manifold	20
to bracket	20

Component	Nm
to sump	20
Front exhaust pipe to exhaust manifold	30
Toothed belt tensioner to tensioning roller	25

1.8 - Checking compressions

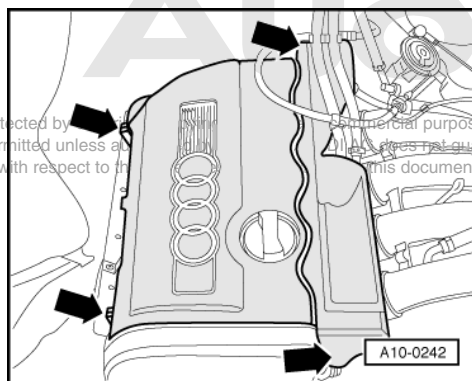
Special tools, testers and auxiliary items

- ◆ Compression tester V.A.G 1381 or V.A.G 1763
- ◆ Spark plug spanner 3122 B

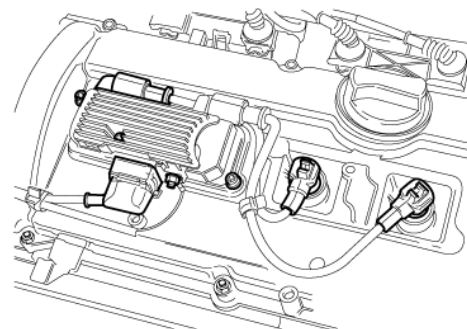
Test requirements

- Engine oil temperature not less than 30 °C

Test sequence



- -> Remove engine cover panels -arrows-.



A15-0019

- -> With the ignition switched off, unscrew and/or unclip connectors and earth wire -arrows- on ignition coil with output stage.
- Unplug connectors from all injectors
- Remove spark plugs with spark plug spanner 3122B.
- Fully open throttle valve.
- Check compressions with compression tester V.A.G 1381 or V.A.G 1763.

**Note:***Using the compression tester*

=> Operating instructions

- Operate starter until tester shows no further pressure increase.

Compression pressure:

New bar	Wear limit bar	Permissible difference between cylinders bar
9.0 ... 14.0	7.5	max. 3.0

- Fit spark plugs and ignition coil with output stage.
- Interrogate fault memory:

=> Motronic injection and ignition system (4-cylinder); Repair group 01; Self-diagnosis of Motronic system; Interrogating and erasing fault memory Self-diagnosis of Motronic system Interrogating and erasing fault memory

=> Motronic injection and ignition system (4-cylinder) 07.96 ä; Repair group 01; Self-diagnosis; Interrogating and erasing fault memory Self-diagnosis Interrogating and erasing fault memory

Note:

Faults will have been recorded in the fault memory because the connectors have been unplugged. Interrogate and, if necessary, erase fault memory after completing the test.

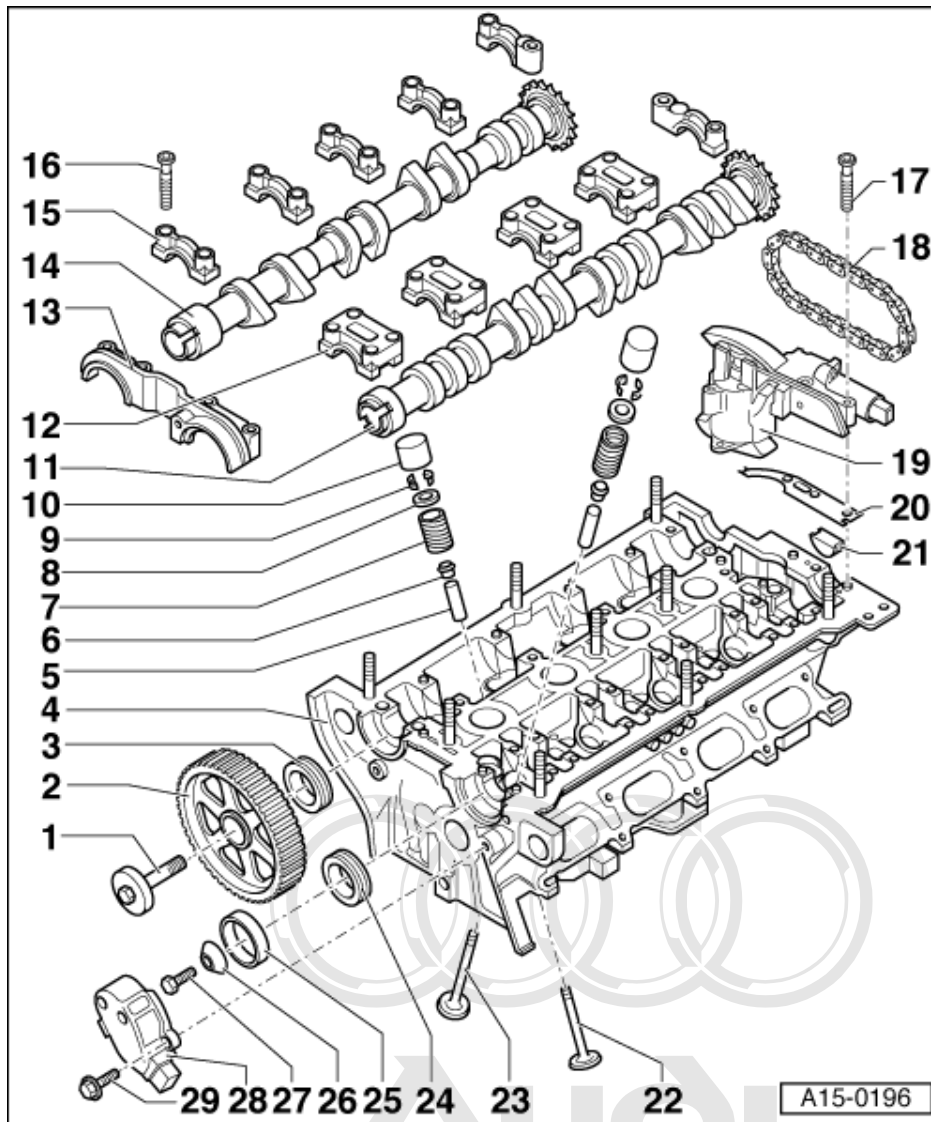
Tightening torques

Component	Nm
Spark plugs in cylinder head	30
Ignition coil with output stage to cylinder head cover	10

2 - Servicing valve gear**2.1 - Servicing valve gear****Notes:**

- ♦ Cylinder heads which have cracks between the valve seats or between valve seat inserts and the spark plug thread can be used further without reducing service life, provided the cracks do not exceed a maximum of 0.3 mm in width, or when no more than the first 4 turns of the spark plug threads are cracked.
- ♦ After installing new tappets wait for approx. 30 minutes before starting engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- ♦ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.
- ♦ Renew all gaskets and seals.

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1 65 Nm

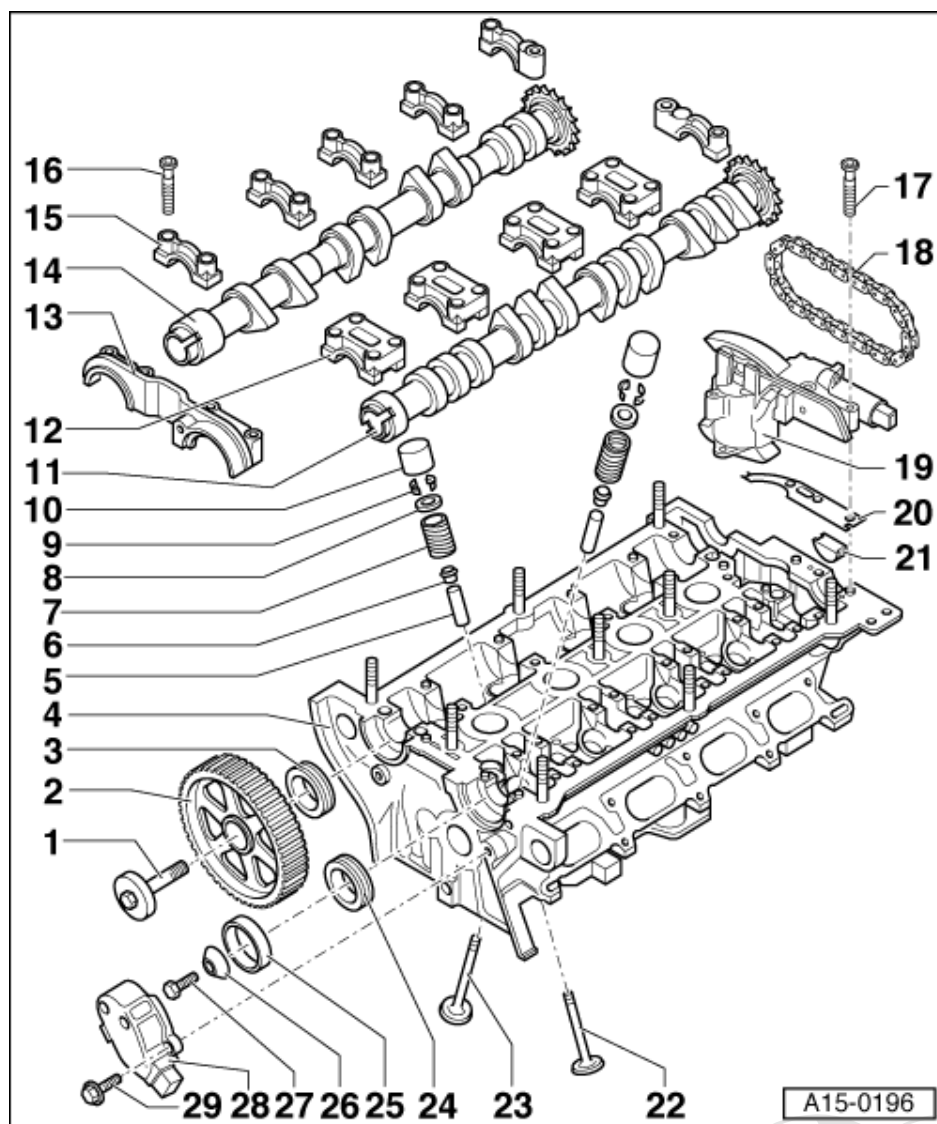
- ♦ Use counter-hold 3036 to loosen and tighten

2 Camshaft sprocket

- ♦ For exhaust camshaft
- ♦ Note installation position:
smaller webs facing forward and TDC marking for cylinder 1 visible from the front=>Page 116

3 Oil seal

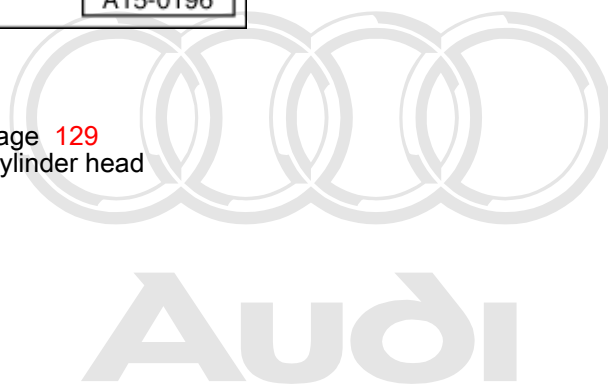
- ♦ For exhaust camshaft
- ♦ Renewing=> Page 113

**4 Cylinder head**

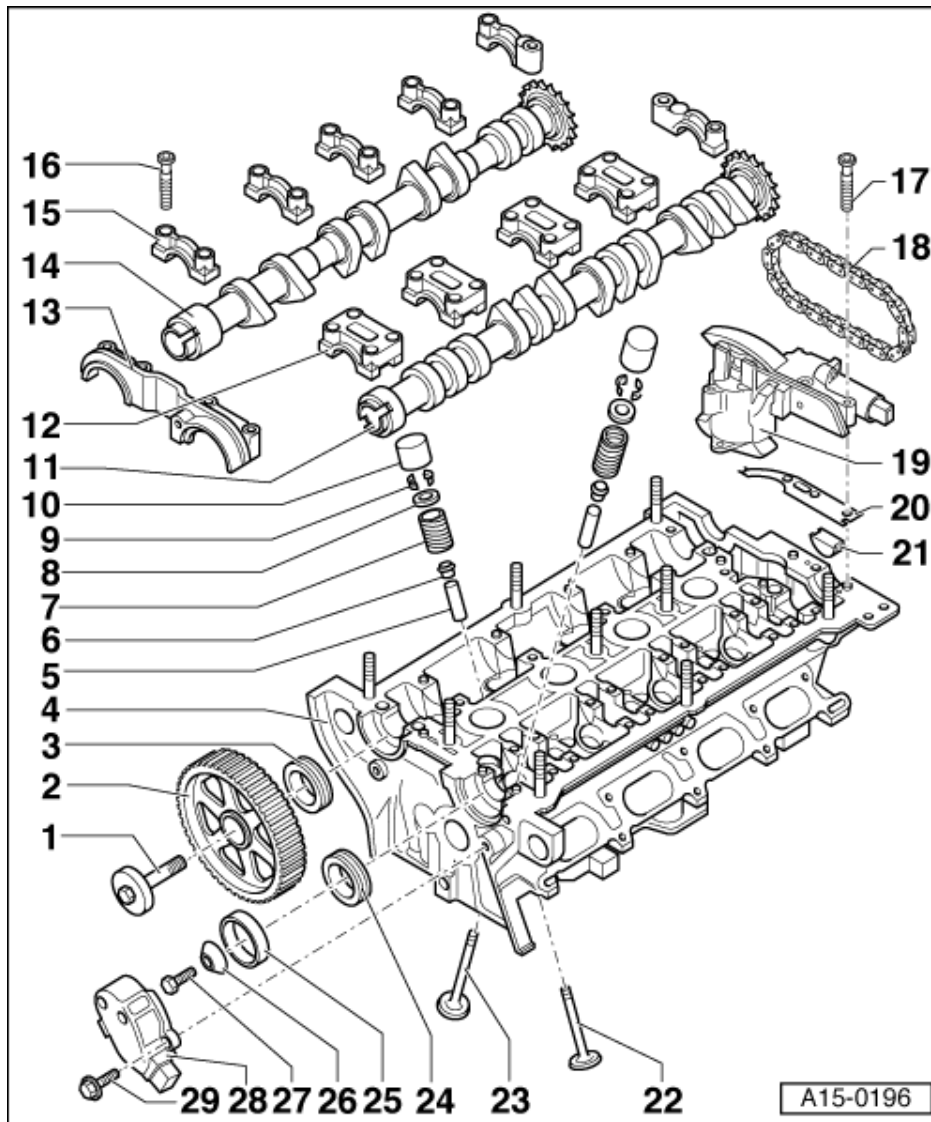
- ♦ See note
=> Page 102
- ♦ Checking valve guides, grinding-in valve seats => Page 129
- ♦ Dowel sleeves for bearing caps must be located in cylinder head
- ♦ Sealing points => Fig. 89
- ♦ Reworking valve seats
=> Page 131

5 Valve guide

- ♦ Checking => Page 129
- ♦ Renewing => Page 129



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6 Valve stem seal

- ♦ Renewing=> Page 127

7 Valve springs

- ♦ Removing and installing
=> Page 127

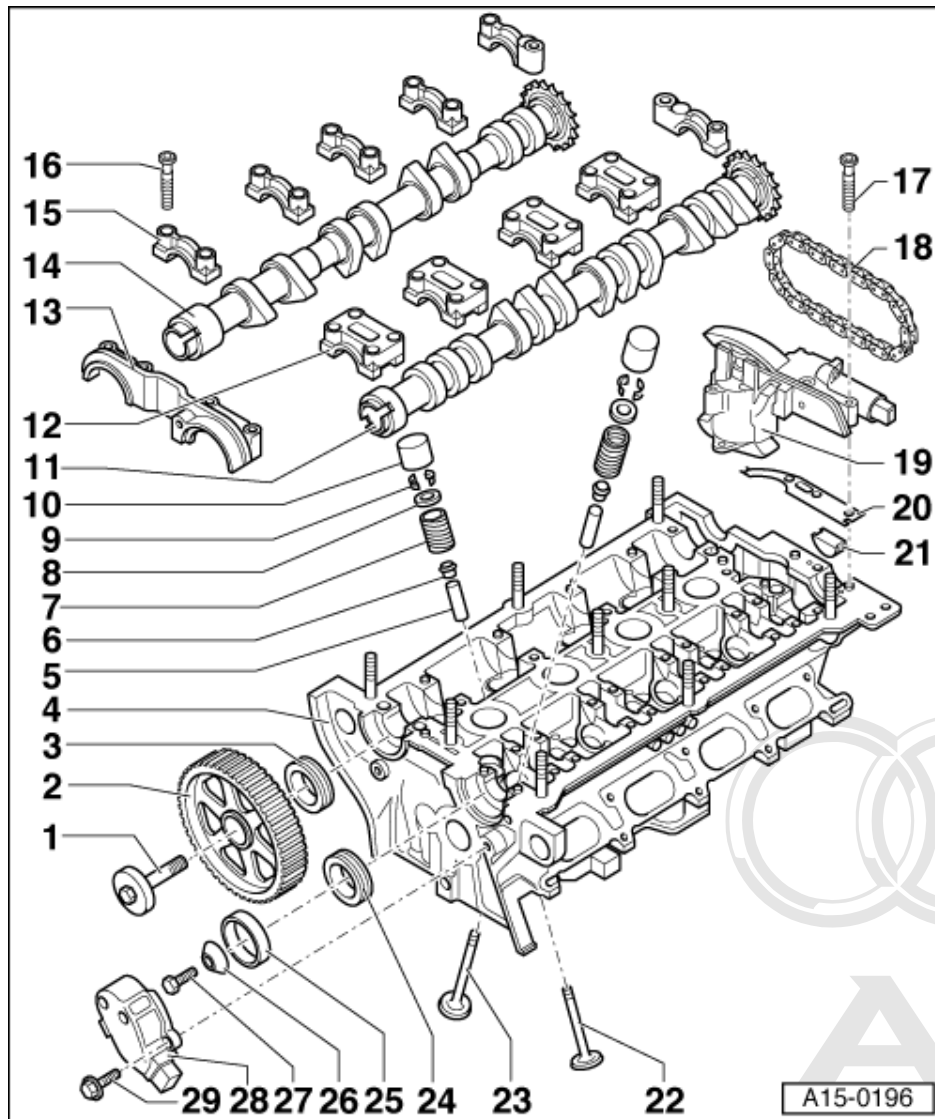
8 Valve spring plate

9 Valve cotters

10 Hydraulic bucket tappet

- ♦ Checking => Page 126
- ♦ Removing and installing
=> Page 127
- ♦ Do not interchange
- ♦ Store with cam contact surface downwards
- ♦ Before installing check camshaft axial clearance => Page 112
- ♦ Oil contact surface

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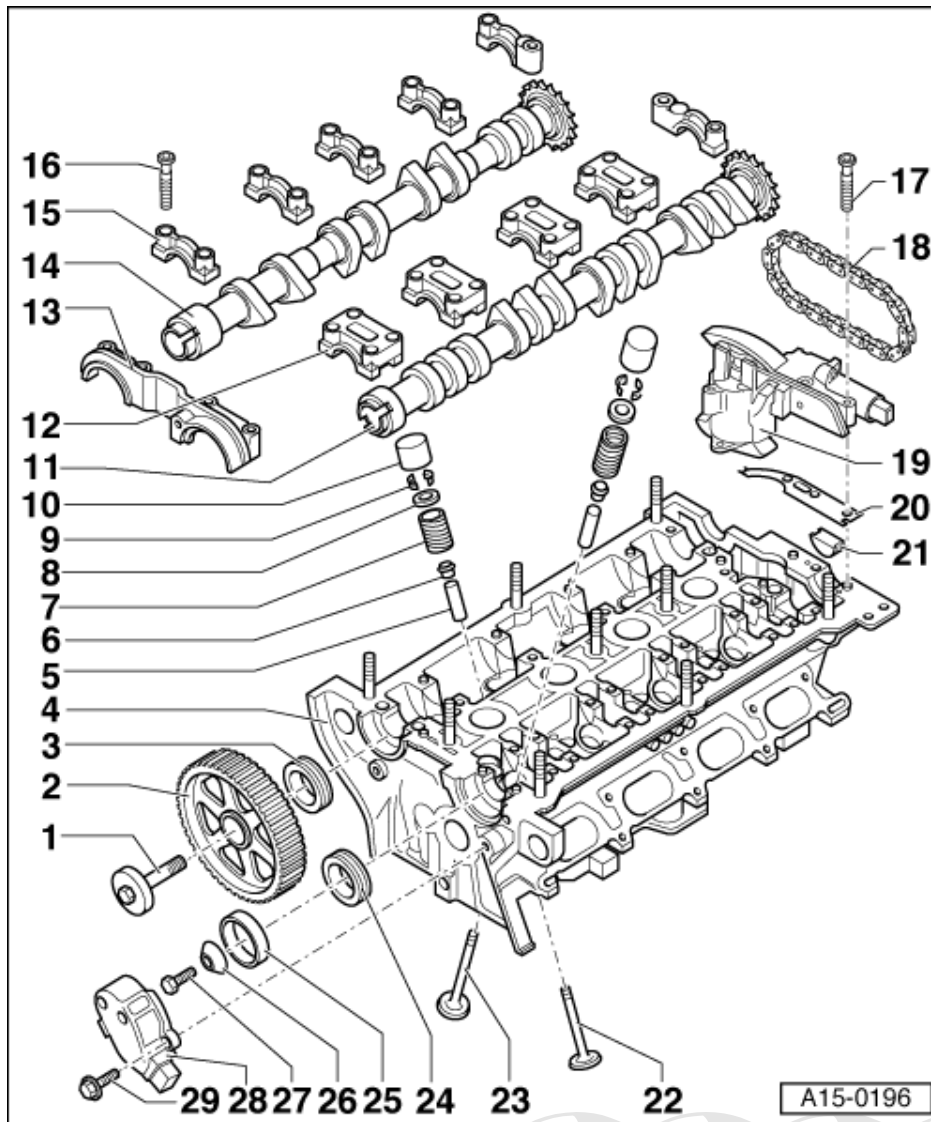
**11 Inlet camshaft**

- ♦ Check radial clearance with plastigage (bucket tappets not installed)
Wear limit: 0.1 mm
- ♦ Run-out: max. 0.01 mm
- ♦ Checking axial clearance
=> Page 112
- ♦ Removing and installing camshafts
=> Page 119

12 Bearing cap for inlet camshaft

- ♦ Must be located on dowel sleeves
- ♦ Dowel sleeves must be located in cylinder head
- ♦ Note installation position
- ♦ Installation sequence
=> Page 122

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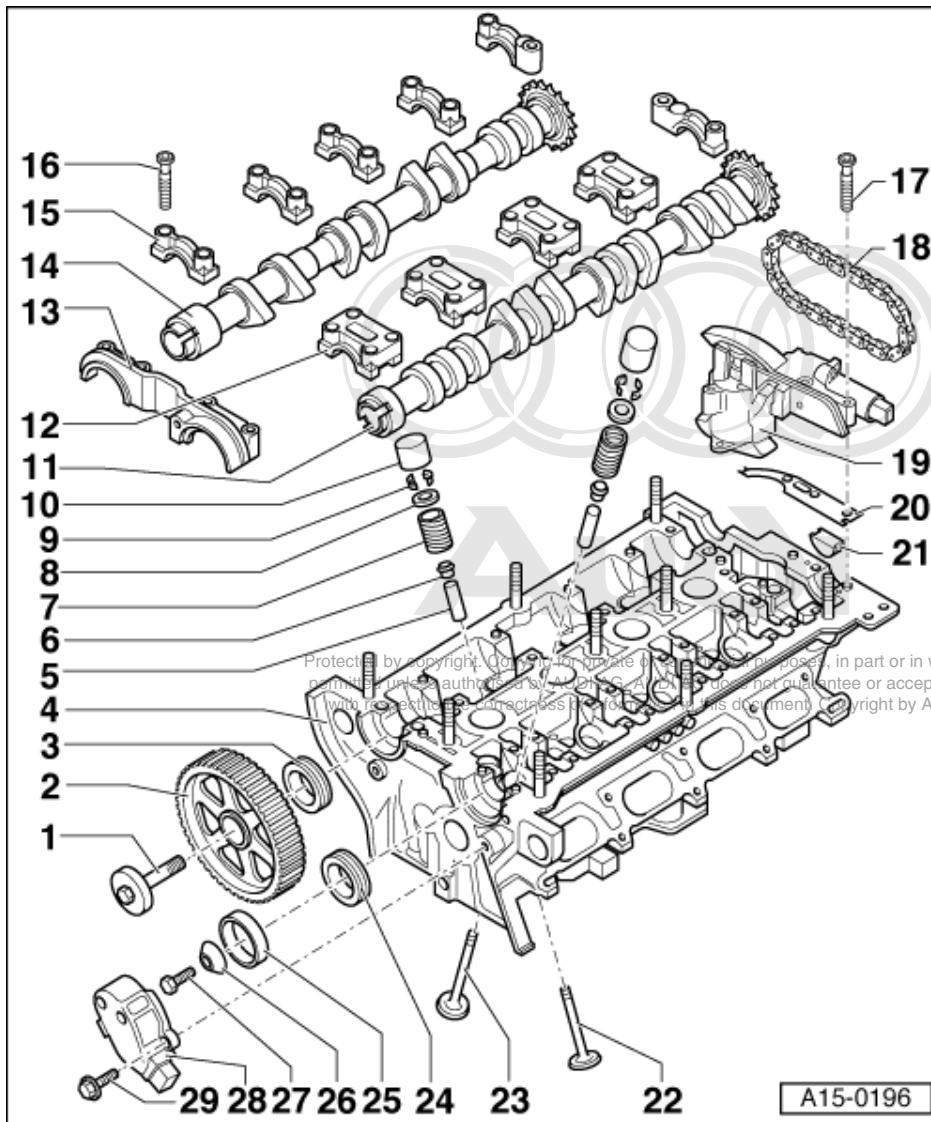
13 Double bearing cap

- ◆ Must be located on dowel sleeves
- ◆ Dowel sleeves must be located in cylinder head
- ◆ Apply a small amount of "D 454 300 A2" to sealing surface before installation=>Page 124
- ◆ Seal sides of joint between double bearing cap and cylinder head => Fig. 88

14 Exhaust camshaft

- ◆ Check radial clearance with plastigage (bucket tappet not installed)
Wear limit: 0.1 mm
- ◆ Run-out: max. 0.01 mm
- ◆ Checking axial clearance
=> Page 112
- ◆ Removing and installing camshafts
=> Page 119

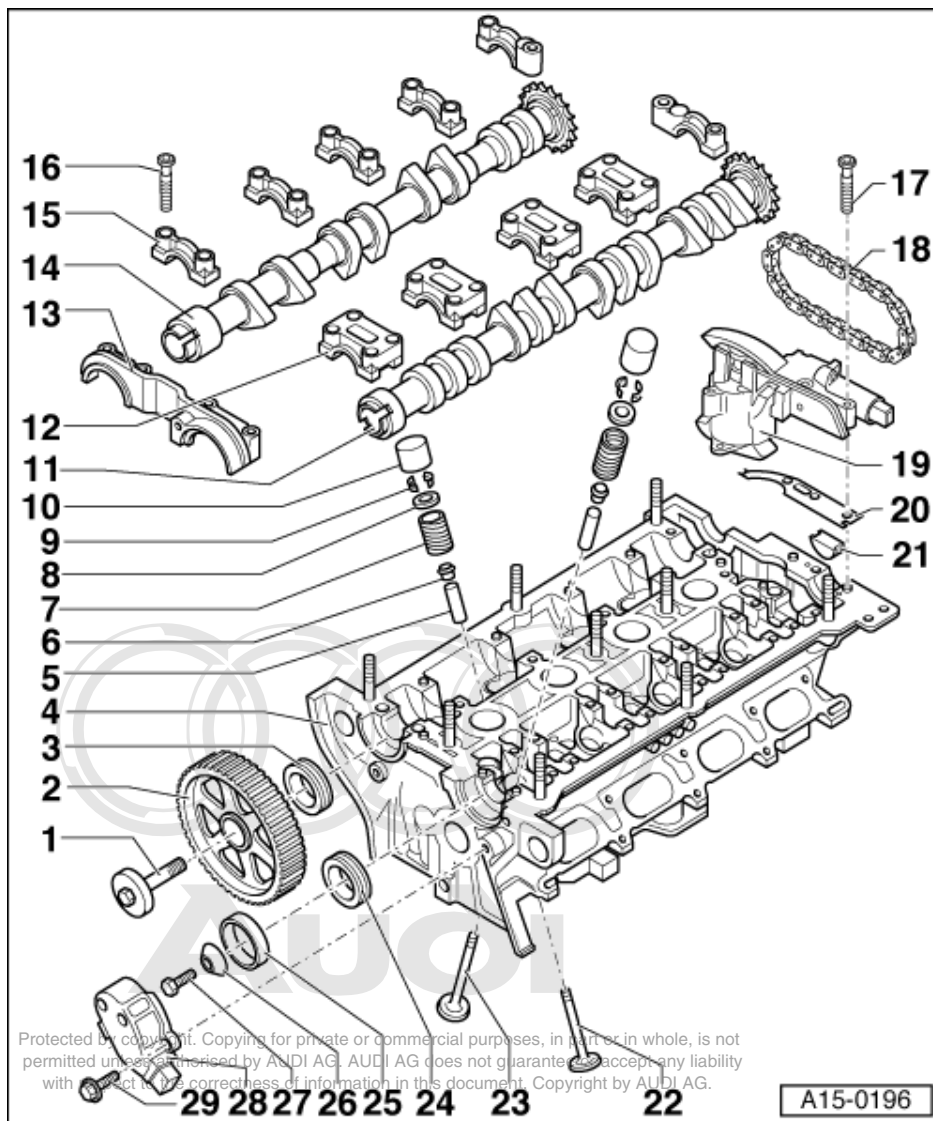
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**15 Bearing cap for exhaust camshaft**

- ◆ Must be located on dowel sleeves
- ◆ Dowel sleeves must be located in cylinder head
- ◆ Note installation position
- ◆ Installation sequence
=> Page 122

16 10 Nm**17 10 Nm****18 Drive chain**

- ◆ Check for wear
- ◆ Mark position of chain before removing=>Page 121
- ◆ Removing and installing:
=>"Removing and installing
camshaft," Page 119



19 Hydraulic chain tensioner

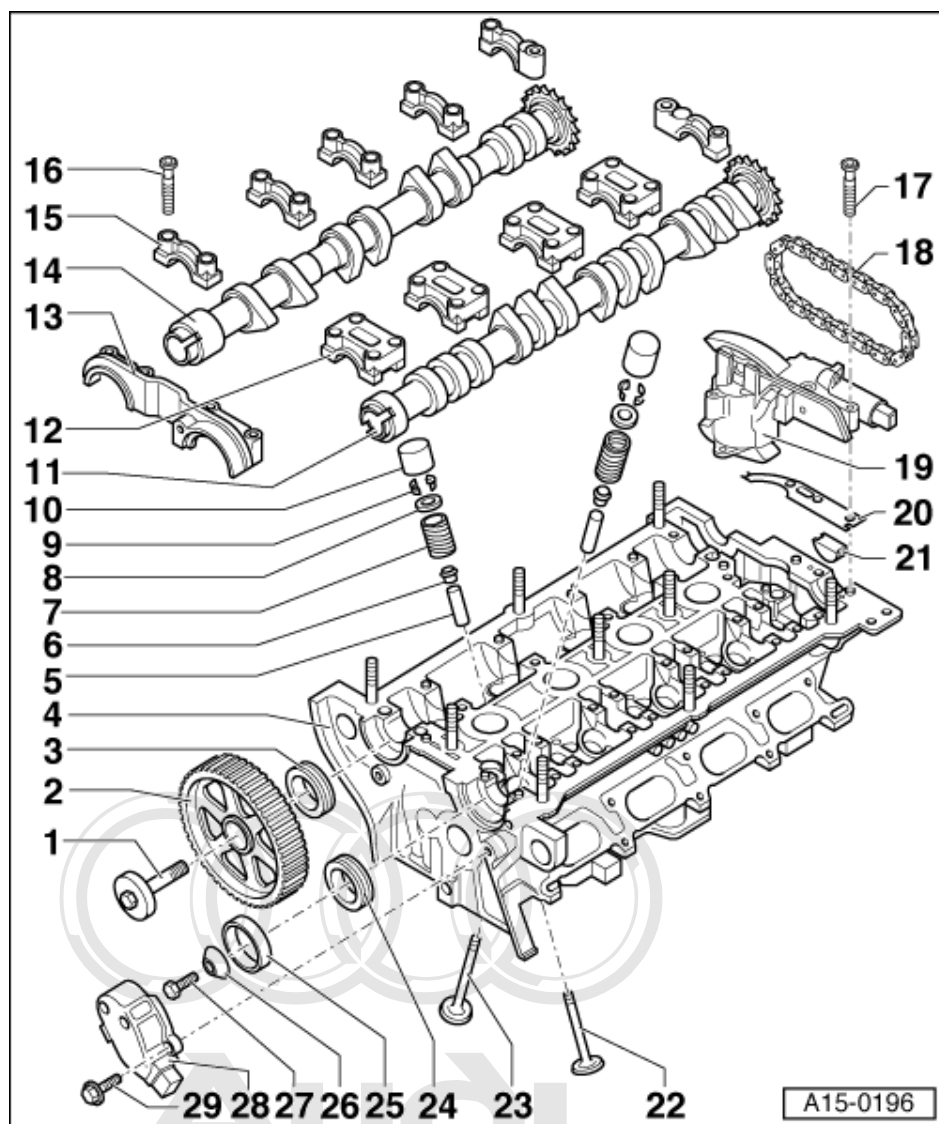
- ◆ Vehicles ä 07.97
- ◆ Secure with retainer for chain tensioner V.A.G 3366 before removing
- ◆ Removing and installing
=> Page 119
- ◆ Seal connections between hydraulic chain tensioner and cylinder head => Fig. 89

19 - Camshaft adjuster

- ◆ Vehicles 08.97 ä
- ◆ With solenoid valve for camshaft adjustment -N205
- ◆ Testing:

=> Motronic injection and ignition system (4-cylinder)07.96 ä;Repair group 28; Testing solenoid valve for camshaft adjustment Testing solenoid valve for camshaft adjustment

- ◆ Hold in position with retainer for chain tensioner 3366 before removing
- ◆ Removing and installing
=> Page 119
- ◆ Seal sides of joints between camshaft adjuster and cylinder head=>Fig. 89

**20 Metal/rubber gasket**

- ◆ Renew=>Page 122

21 Gasket

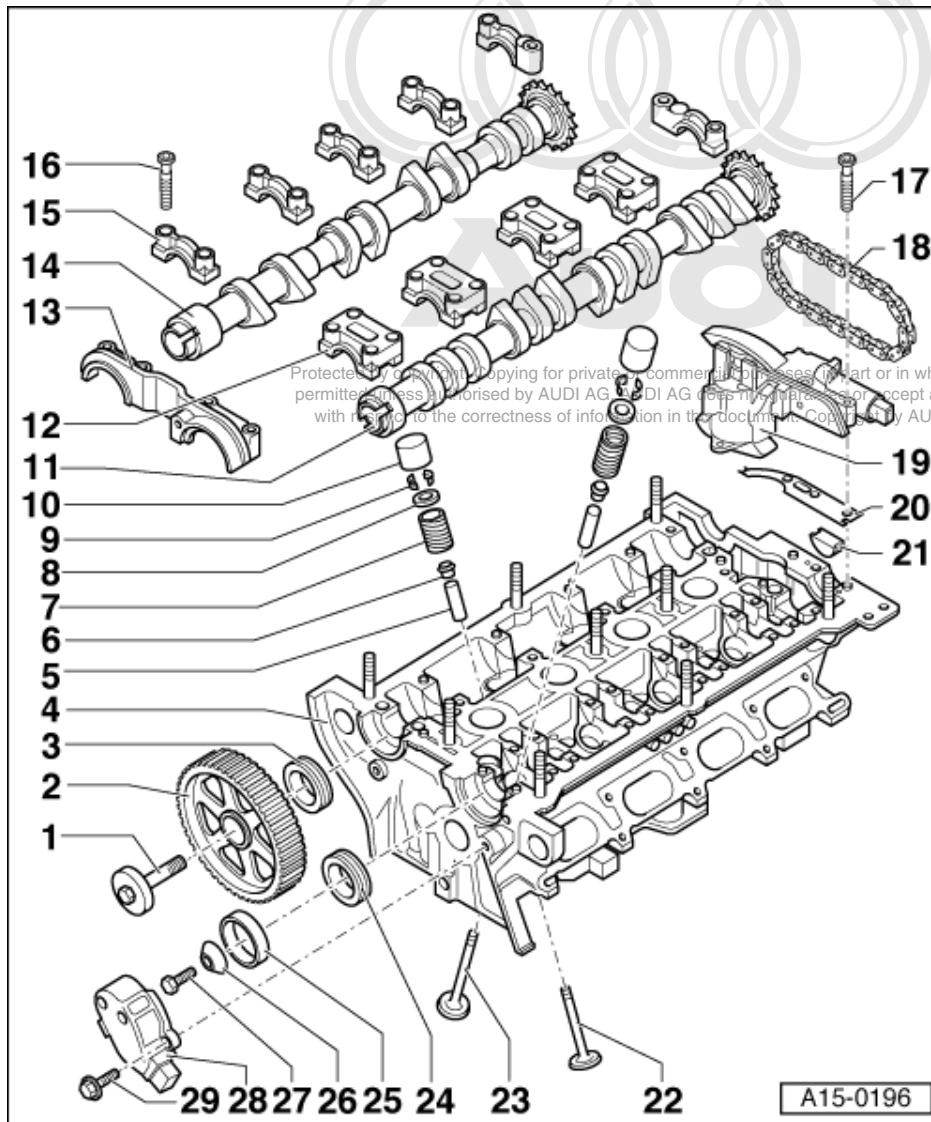
- ◆ Renew

22 Exhaust valve

- ◆ With sodium filling
- ◆ Note instructions on scrapping valves with a sodium filling => Page 112
- ◆ Do not rework, only grinding-in is permitted
- ◆ Valve dimensions => Fig. 1
- ◆ Checking valve guides, grinding in valve seats => Page 129

23 Inlet valve

- ◆ Do not rework, only grinding-in is permitted
- ◆ Valve dimensions => Fig. 1
- ◆ Checking valve guides, grinding in valve seats => Page 129



24 Oil seal

- ♦ For inlet camshaft
- ♦ Renewing=> Page **113**

25 Hall sender rotor

- ♦ Note installation position:
locate lug in notch on camshaft

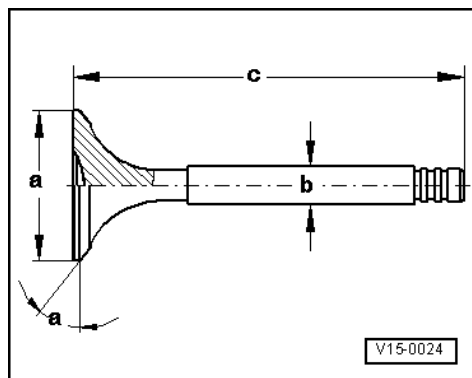
26 Washer

- ♦ Convex
- ♦ Note installation position

27 25 Nm

28 Housing for Hall sender -G40

29 10 Nm



-> Fig. 1 Valve dimensions

Note:

Inlet and exhaust valves must not be reworked. Only grinding-in is permitted.

Dimension		Inlet valve	Exhaust valve
øa	mm	26.80 ... 27.00	29.80 ... 30.00
øb	mm	5.95 ... 5.97	5.94 ... 5.95
c	mm	104.84 ... 105.34	103.64 ... 104.14
font=symbol charset=fontspe- cific code=181 descr='[prop]'	<°	45	45

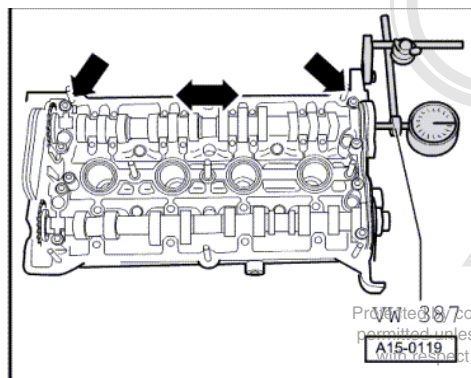
Caution

- ♦ Worn exhaust valves with sodium filling must not be disposed of until they have been treated as follows:
- ♦ The valves must be sawn into two sections with a metal saw at a point between the centre of the shaft and the valve head. They must not come into contact with water when this is done. Then throw the valves into a bucket of water (not more than ten at time). Then step back because a chemical reaction occurs when the sodium filling burns.
- ♦ After this treatment the valves can be disposed of in the normal way.

2.2 - Checking camshaft axial clearance

Special tools, testers and auxiliary items

- ♦ Universal dial gauge bracket VW 387



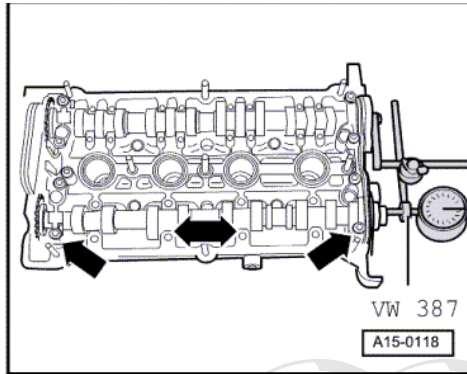
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- ◆ Dial gauge

Perform measurement with bucket tappets removed and with bearing cap at chain sprocket end and double bearing cap at camshaft sprocket end installed.

- Attach dial gauge with universal dial gauge holder VW 387 to cylinder head:

-> Inlet camshaft



-> Exhaust camshaft

Wear limit for inlet and exhaust camshaft.

- ◆ Axial clearance: not more than 0.20 mm

2.3 - Renewing camshaft oil seals

- Cylinder head installed
- Lock carrier must be in service position => Page 19 .

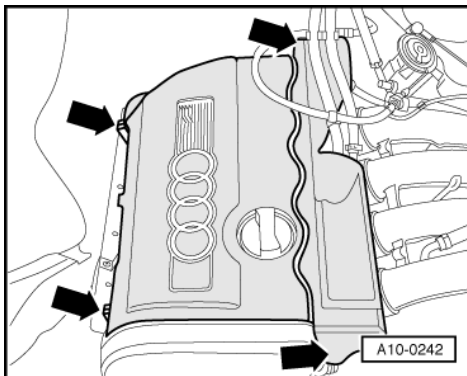
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Special tools, testers and auxiliary items

- ◆ Oil seal extractor 2085
- ◆ Fitting tool 3241
- ◆ Counter-hold tool 3036

Renewing exhaust camshaft oil seal

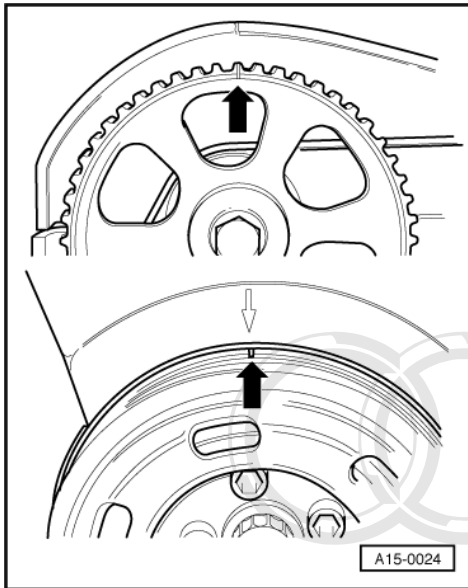
Removing



- Remove ribbed belt and tensioning element for ribbed belt => Page 36 .
- -> Remove engine cover panels -arrows-.

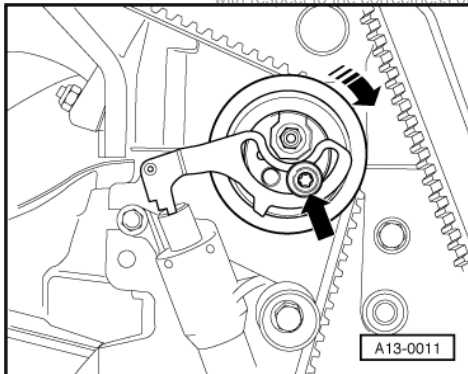


- Remove toothed belt guard (upper) => Page 42 .



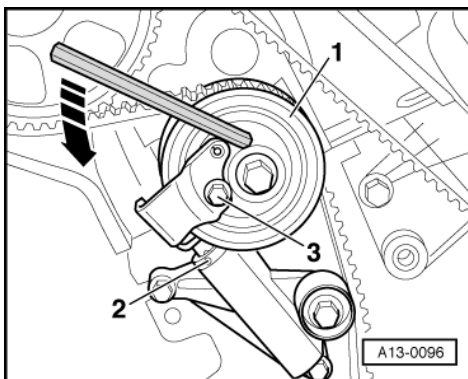
- -> Set crankshaft to markings for TDC of No. 1 cylinder -arrows- by turning central bolt on crankshaft sprocket in direction of rotation.

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- -> Loosen toothed belt tensioner with Torx wrench T45 -lower arrow-.
- Press toothed belt tensioner downwards.
- Take toothed belt off camshaft sprocket.

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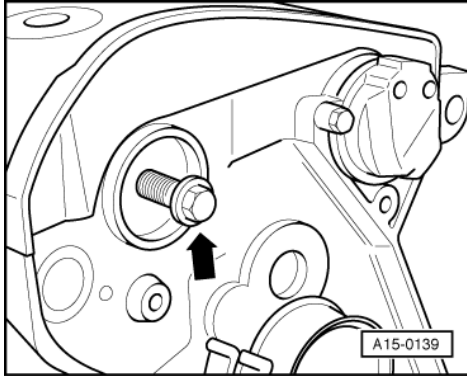


- -> Using 8 mm hexagon key, turn toothed belt tensioning roller -1- slowly and with constant firm pressure in direction of arrow, so that holes -2- in tensioner piston and housing are aligned.
- With the tensioner in this position, insert a suitable retaining pin (such as a 2 mm drill bit or nail) into the two holes.
- Take toothed belt off camshaft sprocket.

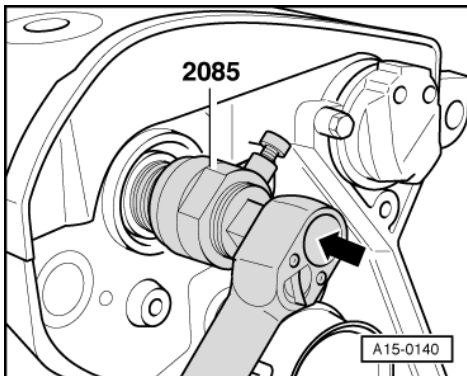
Note:

Do not remove bolt -3-.

All models

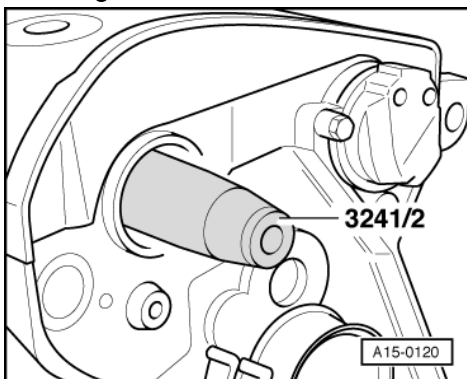


- Loosen camshaft sprocket (counter-hold with 3036).
- Pull off camshaft sprocket.
- -> To guide oil seal extractor, screw securing bolt for camshaft sprocket -arrow- into camshaft as far as it will go by hand.
- Unscrew inner part of oil seal extractor 2085 two turns (approx. 3 mm) out of the outer part and lock in position with knurled screw.



- -> Lubricate threaded head of oil seal extractor 2085, place it in position and, exerting firm pressure, screw it into oil seal as far as possible.
- Loosen knurled screw and turn inner part of extractor against camshaft until oil seal has been extracted.
- Clamp flats of oil seal extractor in vice. Remove oil seal with pliers.

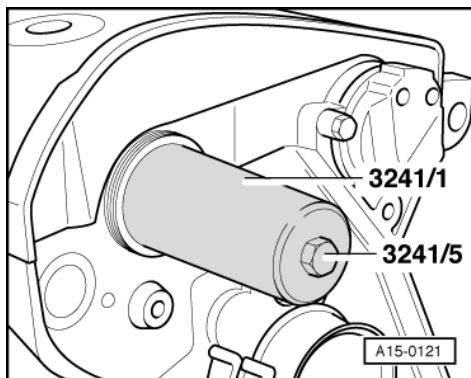
Installing



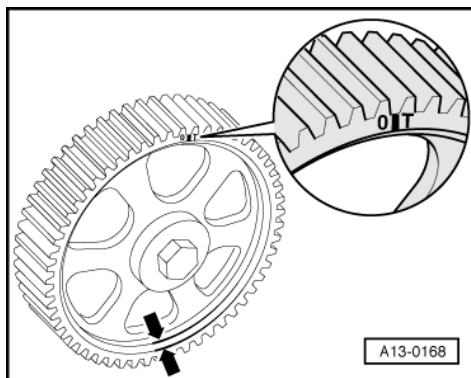
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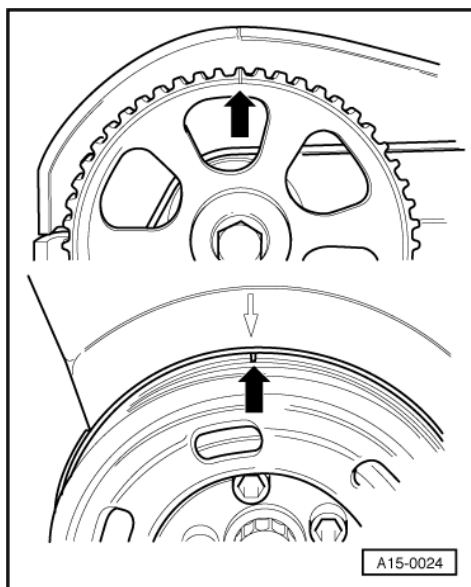
- Lightly oil sealing lip of oil seal.
- -> Fit guide sleeve 3241/2 onto camshaft journal.
- Slide oil seal over guide sleeve.



- -> Press oil seal in onto stop with press sleeve 3241/1. To do this use bolt 3241/5.



- -> Install camshaft sprocket.
- Check installation position:
The narrow web of the camshaft sprocket faces outwards -arrows- and the marking for No.1 cylinder TDC is visible from the front.
- Install securing bolt for camshaft sprocket (use retainer tool 3036).



- -> Align camshaft sprocket mark with marking on cylinder head cover.
- Align marking on vibration damper with marking on lower part of toothed belt guard.



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Note:

If a piston is at TDC the valves could strike the piston when turning the camshaft. To avoid damage to valves and pistons the pistons must not be at TDC.

- Install toothed belt (adjust valve timing)=>Page 56 .

Note:

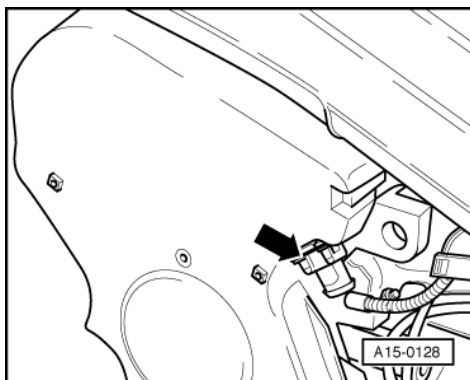
Observe all instructions for removing and installing toothed belt =>Page 46 .

- Install ribbed belt and ribbed belt tensioning element=>Page 37 .

Tightening torques

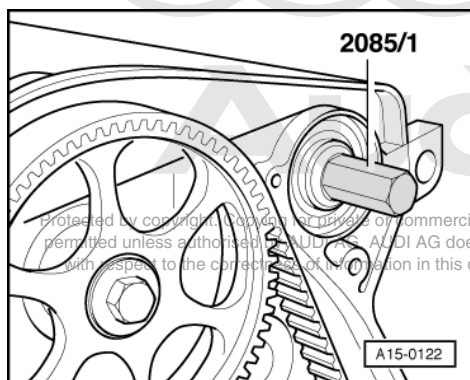
Component	Nm
Camshaft sprocket to camshaft	65
Ribbed belt tensioner to bracket	25

Renewing inlet camshaft oil seal



Removing

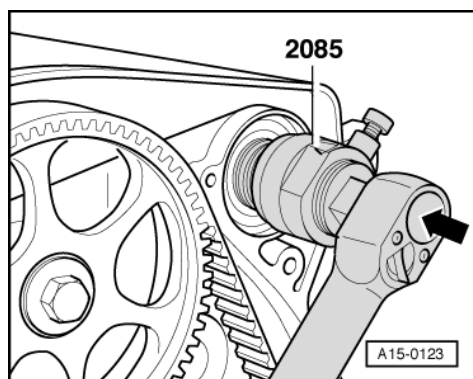
- Remove ribbed belt and tensioning element for ribbed belt => Page 36 .
- -> Pull connector off Hall sender -G40 -arrow-.
- Remove toothed belt guard (upper section) => Page 42 .
- Remove Hall sender housing.
- Remove Hall sender rotor and washer.



- -> To guide oil seal extractor, screw bolt 2085/1 by hand into camshaft as far as it will go.

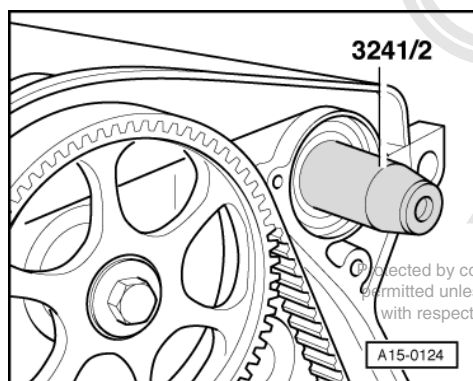


- Unscrew inner part of oil seal extractor 2085 two turns (approx. 3 mm) out of the outer part and lock in position with knurled screw.

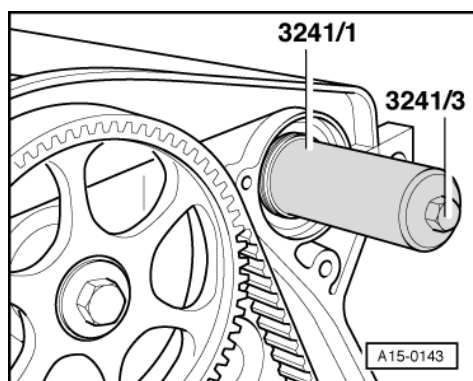


- -> Lubricate threaded head of oil seal extractor 2085, place it in position and, exerting firm pressure, screw it into oil seal as far as possible.
- Loosen knurled screw and turn inner part of extractor against camshaft until oil seal has been extracted.

Installing



- Lightly oil sealing lip of oil seal.
- -> Fit guide sleeve 3241/2 onto camshaft journal.
- Slide oil seal over guide sleeve.



- -> Press oil seal in onto stop with press sleeve 3241/1. To do this use bolt 3241/3.
- Install Hall sender=>Page 111 .
- Install toothed belt guard (upper section).
- Install ribbed belt and ribbed belt tensioning element=>Page 37 .

Tightening torques

Component	Nm
Hall sender rotor to camshaft	25

Component	Nm
Hall sender housing to cylinder head	10

2.4 - Removing and installing camshafts and hydraulic chain tensioner / camshaft adjuster

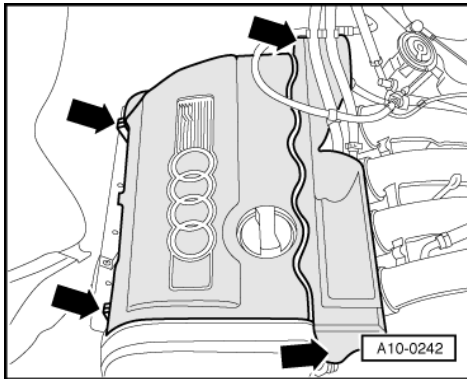
- Cylinder head installed
- Lock carrier must be in service position => Page 19 .

Special tools, testers and auxiliary items

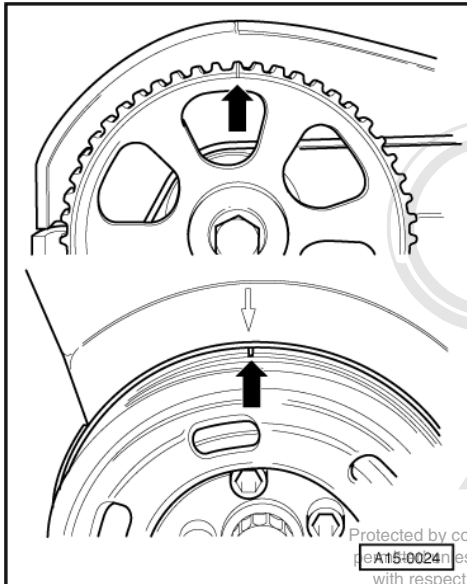
- ♦ Counter-hold tool 3036
- ♦ Retainer for chain tensioner 3366

Removing

- Remove ribbed belt and tensioning element for ribbed belt => Page 36 .



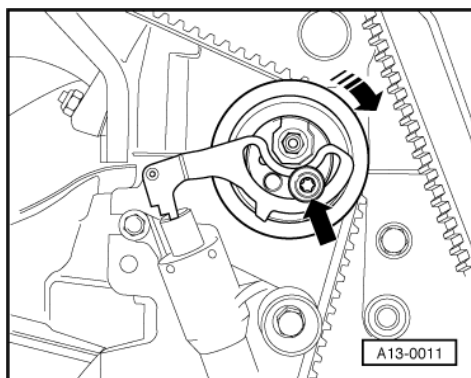
- -> Remove engine cover panels -arrows-.
- Remove toothed belt guard (upper section) => Page 42 .



- -> Set crankshaft to markings for TDC of No. 1 cylinder -arrows- by turning central bolt on crankshaft sprocket in direction of rotation.
- Remove cylinder head cover => Page 94 .

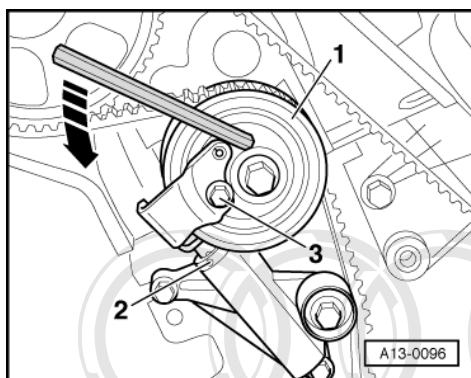


Vehiclesä 07.97:



- -> Loosen toothed belt tensioner with Torx wrench T45 -lower arrow-.
- Press toothed belt tensioner downwards.
- Take toothed belt off camshaft sprocket.

Vehicles08.97 ä:



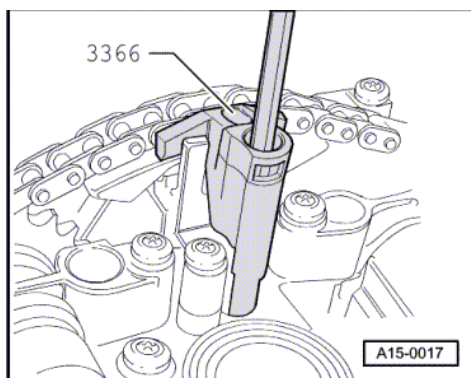
- -> Using 8 mm hexagon key, turn toothed belt tensioning roller -1- slowly and with constant firm pressure in direction of arrow, so that holes -2- in tensioner piston and housing are aligned.
- With the tensioner in this position, insert a suitable retaining pin (such as a 2 mm drill bit or nail) into the two holes.
- Take toothed belt off camshaft sprocket.

Note:

Do not remove bolt -3-.

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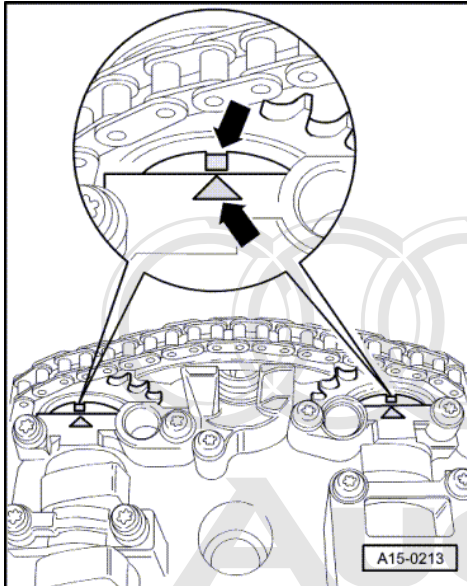
- Loosen camshaft sprocket (counter-hold with 3036).
- Pull off camshaft sprocket.
- Remove Hall sender housing.
- Remove rotor for Hall sender.



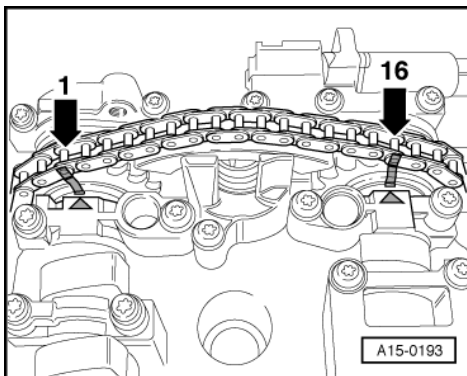
- -> Secure hydraulic chain tensioner / camshaft adjuster using retainer for chain tensioner 3366.

Note:

If the retainer for chain tensioner is tightened excessively, this can damage the hydraulic chain tensioner / camshaft adjuster.



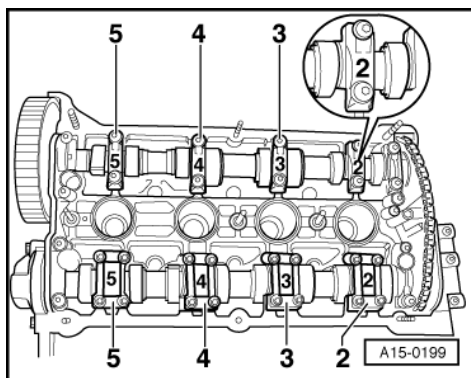
- -> Re-check TDC position of camshafts.
- The marks on the two camshafts must be in line with the arrows on the bearing caps.
- Clean drive chain and camshaft chain sprockets opposite arrows on bearing caps and mark position of chain on sprockets with a coloured marking opposite the two arrows.



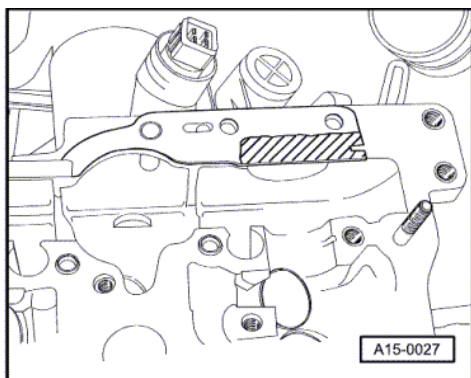
- -> The distance between the two arrows (and thus between the coloured markings) is 16 rollers on the chain.
- The notch on the exhaust camshaft is offset slightly towards the inside in relation to chain roller -1-.

Note:

Do not mark chain with a centre punch or by making a notch or similar.

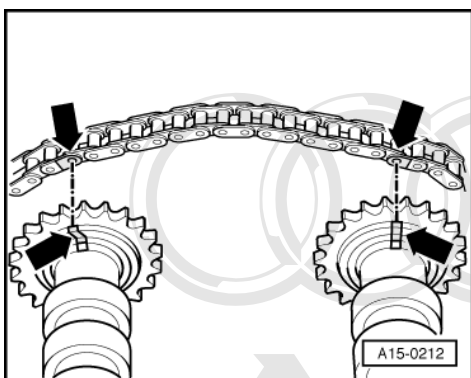


- -> First remove bearing caps 3 and 5 on inlet and exhaust camshafts.
- Remove double bearing cap.
- Remove both bearing caps next to inlet and exhaust camshaft chain sprockets.
- Unscrew and remove securing bolts of hydraulic chain tensioner / camshaft adjuster.
- Slacken off bearing caps 2 and 4 of inlet and exhaust camshafts alternately in diagonal sequence, and remove.
- Remove inlet and exhaust camshafts together with hydraulic chain tensioner / camshaft adjuster.



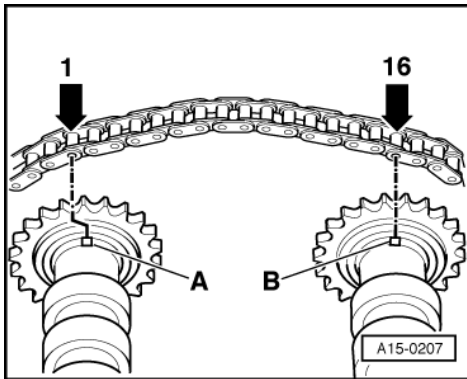
Installing

- -> Renew rubber/metal gasket for hydraulic chain tensioner / camshaft adjuster and apply a thin coat of sealant "D 454 300 A2" to the shaded area.



- Fit drive chain on camshaft sprockets as follows:
 - -> When the old chain is being re-installed, fit the chain so that the coloured markings are in line -arrows-.

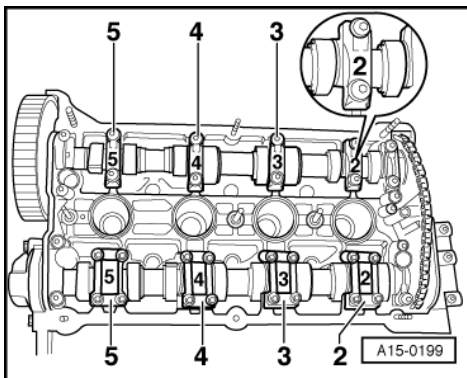
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- -> When a new chain is being installed, the distance between the notches -A- and -B- on the camshafts must be 16 rollers on the chain. The illustration shows the exact positions of the 1st and 16th rollers on the sprockets.
- Notch -A- is offset slightly towards the inside in relation to chain roller -1-.
- Insert hydraulic chain tensioner / camshaft adjuster into the chain.
- Position camshafts together with chain and hydraulic chain tensioner / camshaft adjuster on cylinder head.
- Oil running surfaces of both camshafts.

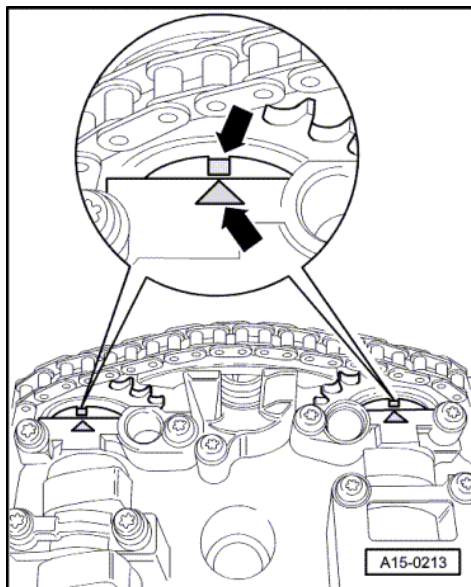
Notes:

- ♦ Dowel sleeves for bearing caps and hydraulic chain tensioner / camshaft adjuster must be located in cylinder head.
- ♦ When installing bearing caps, ensure that identification mark is visible from inlet side of cylinder head.
- Tighten mountings of hydraulic chain tensioner / camshaft adjuster (watch position of dowel sleeves).



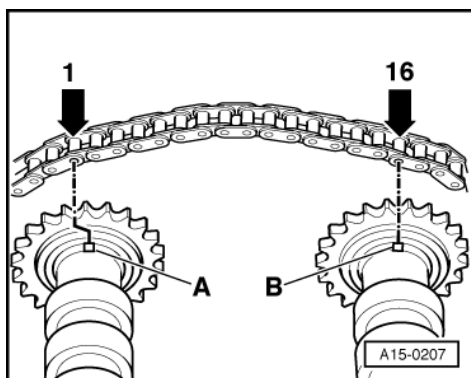
- -> Tighten bearing caps 2 and 4 of inlet and exhaust camshafts in stages and in diagonal sequence (watch position of dowel sleeves).
- Install the two bearing caps next to the chain sprockets on the inlet and exhaust camshafts.

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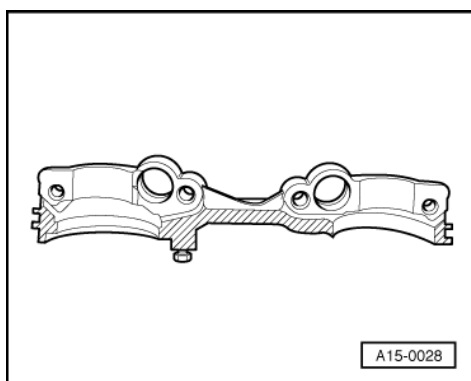


- Check correct setting of camshafts:

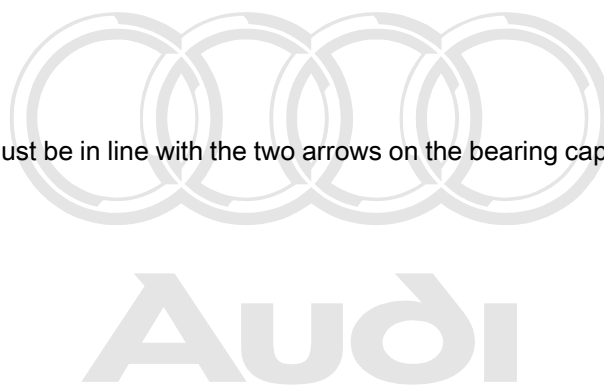
- -> The two markings on the camshafts must be in line with the two arrows on the bearing caps -arrows-.



- -> The distance between the two arrows on the bearing caps (or between the coloured markings) is 16 rollers on the chain.
- The notch on the exhaust camshaft is offset slightly towards the inside in relation to chain roller -1-.

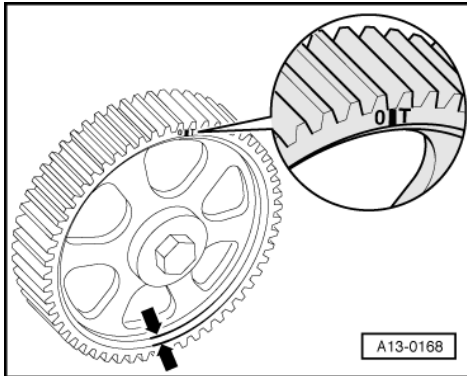


- Remove holder for chain tensioner 3366.
- -> Apply a thin coat of sealant "D 454 300 A2" to shaded area on double bearing cap and install bearing cap (watch position of dowel sleeves).
- Install remaining bearing caps (watch position of dowel sleeves).

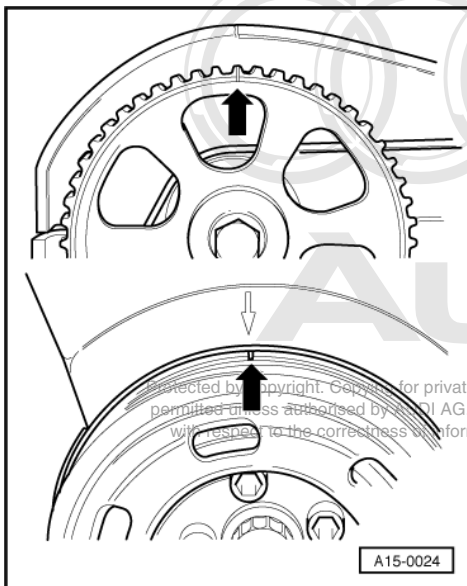


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- Install new inlet and exhaust camshaft oil seals=>Page 113 .



- -> Install camshaft sprocket.
- Check installation position:
The narrow web of the camshaft sprocket faces outwards -arrows- and the marking for No.1 cylinder TDC is visible from the front.
- Install securing bolt for camshaft sprocket (hold in place with retainer 3036).
- Install Hall sender=>Page 111 .
- Install cylinder head cover =>Page 95 .



- -> Align camshaft sprocket mark with marking on cylinder head cover.
- Align marking on vibration damper with marking on lower part of toothed belt guard.

Note:

The crankshaft must not be at TDC when the camshaft is rotated, otherwise valves can contact pistons and cause damage.

- Install toothed belt (adjust valve timing)=>Page 56 .
- Install ribbed belt and ribbed belt tensioning element=>Page 37 .

Notes:

- ◆ Follow all instructions for removing and installing toothed belt =>Page 46 .
- ◆ Wait about 30 minutes after installing the camshafts before starting the engine. The hydraulic valve compensating elements must settle (otherwise the valves will strike the pistons).



- ♦ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

Tightening torques

Component	Nm
Bearing caps to cylinder head	10
Hydraulic chain tensioner / camshaft adjuster to cylinder head	10
Hall sender rotor to camshaft	25
Hall sender housing to cylinder head	10
Ribbed belt tensioner to bracket	25
Camshaft sprocket to camshaft	65

2.5 - Checking hydraulic bucket tappets

Special tools, testers and auxiliary items

- ♦ Feeler gauge
- ♦ Wood or plastic wedge

Notes:

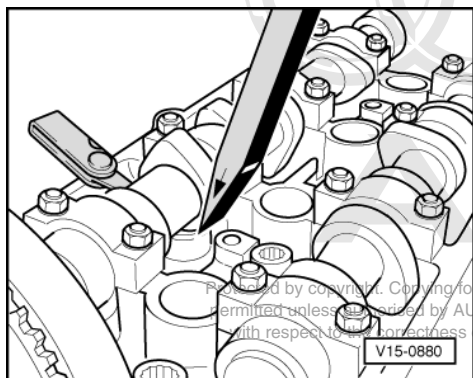
- ♦ Hydraulic tappets cannot be adjusted or repaired.
- ♦ Irregular valve noises when starting engine are normal.
- Start engine and run until coolant temperature reaches approx. 80 °C.
- Increase engine speed to about 2500 rpm for 2 minutes (perform road test if necessary).

Note:

If the irregular valve noises stop but recur repeatedly during short journeys, a new oil retention valve must be fitted. The oil retention valve is located in the oil filter bracket => Page 139.

If the hydraulic tappets are still noisy, locate defective tappets as follows:

- Remove cylinder head cover => Page 94.
- Rotate crankshaft until the cams of the tappets to be checked are pointing upwards:
 - Vehicles with manual gearbox: push vehicle forwards with 4th gear engaged and ignition switched off.
 - Vehicles with automatic gearbox: remove noise insulation and turn crankshaft clockwise by applying spanner to central bolt on crankshaft sprocket.
- Measure play between cam and tappet.



- -> Press tappet down with a wooden or plastic wedge. If an 0.20 mm feeler gauge can be inserted between camshaft and tappet, renew tappet.

- Renewing tappet=>Removing and installing camshafts and hydraulic chain tensioner / camshaft adjuster, Page **119**.

Notes:

- ◆ Wait about 30 minutes after installing the camshafts before starting the engine. The hydraulic valve compensating elements must settle (otherwise the valves will strike the pistons).
- ◆ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

2.6 - Renewing valve stem seals

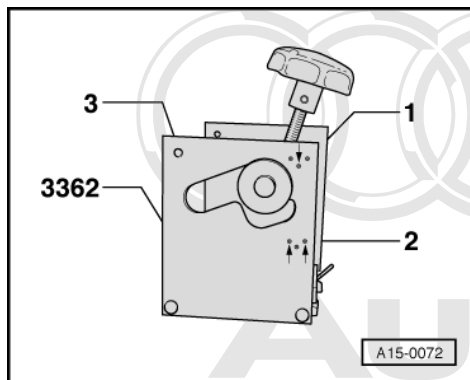
- Cylinder head installed

Special tools, testers and auxiliary items

- ◆ Pressure hose VW 653/3
- ◆ Spark plug spanner 3122 B
- ◆ Fitting tool 3362 with press piece 3362/1
- ◆ Puller 3364
- ◆ Fitting tool 3365

Removing

- Remove camshafts and hydraulic chain tensioner / camshaft adjuster=>Page **119**.
- Remove the bucket tappets and put them down with the contact surface downwards. When doing this ensure that the tappets are not interchanged.
- Remove spark plugs with spark plug spanner 3122B.
- Set piston of appropriate cylinder to "bottom dead centre".
- Screw pressure hose VW 653/3 into the spark plug thread.

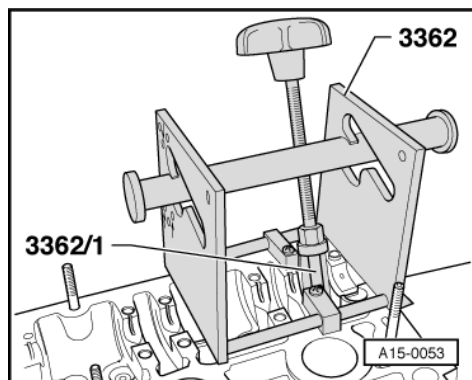


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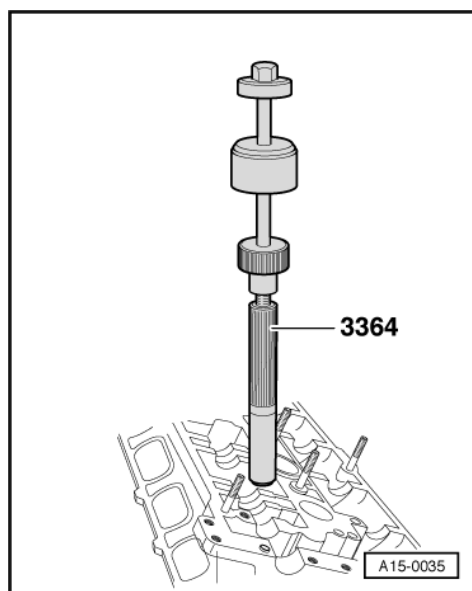
Tight cotters can be loosened by tapping lightly on the valve spring plate.

-> The inlet and exhaust valves are fitted at different angles in the cylinder head. Valve spring compressor 3362 can be set accordingly to two different positions:

- 1 - upper position for centre inlet valve
- 2 - lower position for the two outer inlet valves and the two exhaust valves
- 3 - Threaded holes on each side to take two M6 x 25 bolts for securing spring compressor to cylinder head

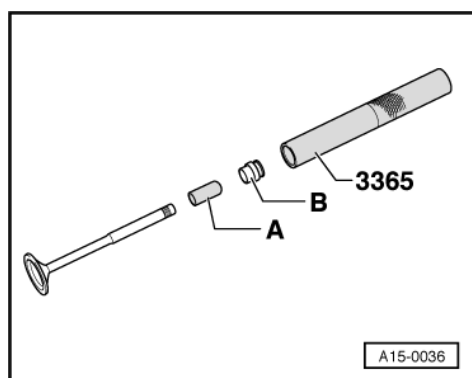


- -> Mount spring compressor 3362 on cylinder head with securing bolts provided.
- Set the correct position for the valve concerned.
- Connect pressure hose to compressed air supply.
 - Air pressure: at least 6 bar
- Press valve springs down with threaded spindle and thrust piece 3362/1 and remove.

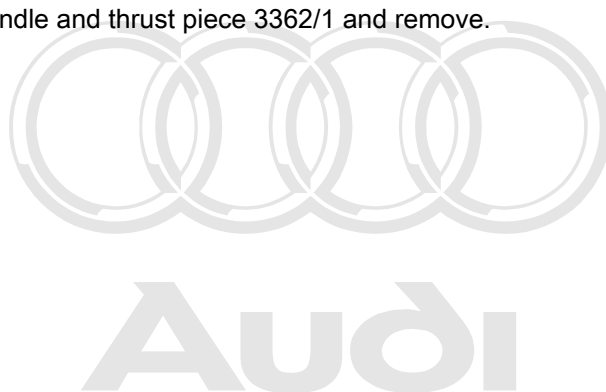


- -> Pull off valve stem seals with extractor 3364.

Installing



- -> To prevent damage to the new valve stem seals, place plastic sleeve -A- on valve stem.
- Lightly oil sealing lip of valve stem seal -B-.
- Place valve stem seal in tool 3365 and push carefully onto valve guide.
- Take off plastic sleeve.
- Install camshafts => Page 122 .



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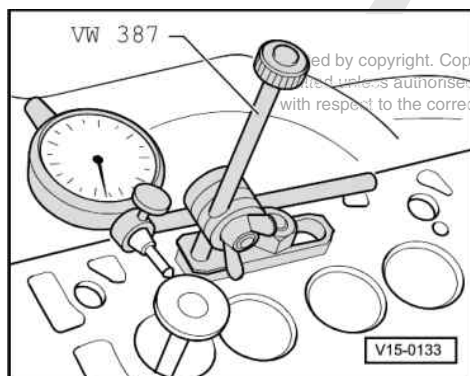
Notes:

- ♦ After installing new tappets wait for approx. 30 minutes before starting engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- ♦ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

2.7 - Checking valve guides

Special tools, testers and auxiliary items

- ♦ Universal dial gauge bracket VW 387
- ♦ Dial gauge



- -> Insert valve into valve guide until end of valve stem is flush with end of guide. Due to the different stem diameters, use only an inlet valve in the inlet guide and an exhaust valve in the exhaust guide.
- Measure the amount of sideways play.

Wear limit

Inlet valve guide	Exhaust valve guide
0.80 mm	0.80 mm

Notes:

- ♦ If the wear limit is exceeded, repeat the measurement with new valves. If the wear limit is again exceeded, renew the valve guide.
- ♦ If the valve is to be renewed as part of a repair, use a new valve for the calculation.

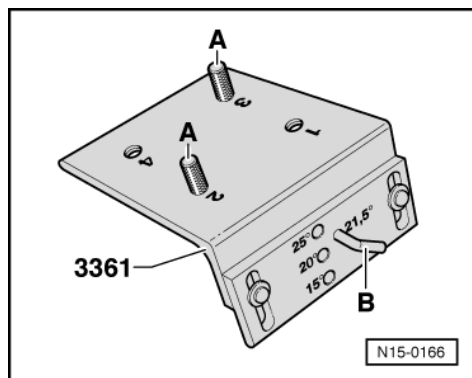
2.8 - Renewing valve guides

Special tools, testers and auxiliary items

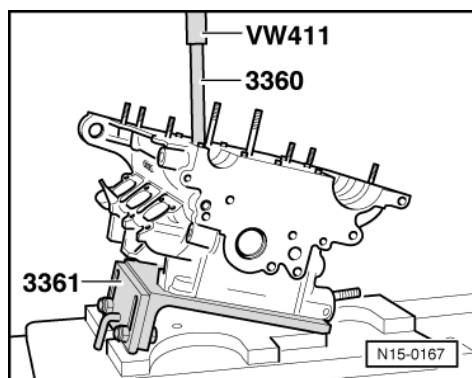
- ♦ Press tool VW 411
- ♦ Hand reamer 3120 and cutting fluid
- ♦ Drift 3360
- ♦ Support 3361

Removing

- Clean and check cylinder head. Cylinder heads in which the valve seats can no longer be reworked, or cylinder heads which have already been machined to the minimum dimension, should not have the valve guides replaced.



- -> Set up the support plate as follows:
 - Insert locating pins for cylinder head bolt drillings -A- in holes 2 and 3.
 - Insert pin -B- in the correct hole for the valve angle:
 - Outer inlet valves: 21.5°
 - Centre inlet valve: 15°
 - Exhaust valves: 20°



- -> Press out the worn valve guides using drift 3360 as follows:
 - Valve guides without shoulder:
from the camshaft side
 - Valve guides with shoulder (repair version):
from the combustion chamber side

Installing

- Oil new valve guides. Using drift 3360, press into cold cylinder head from the camshaft side until the shoulder makes contact.

Note:

When the shoulder on the valve guide makes contact, the pressure must not exceed 10 kN (approx. 1.0 t) otherwise the shoulder can break off.

- Ream guides out with hand reamer 3363 using plenty of cutting fluid.
- Rework valve seats => Page 131 .
- Renew valve stem seals => Page 127 .

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2.9 - Reworking valve seats

Note:

If a good seating pattern cannot be obtained by grinding the valve seats (lapping), they must be refaced (re-worked):

Special tools, testers and auxiliary items required

- ♦ Depth gauge
- ♦ Valve seat refacing tool

Notes:

- ♦ When repairing engines with leaking valves, it is not sufficient to reface the valve seats and renew the valves. The valve guides must also be checked for wear. This is particularly important on high mileage engines =>Page 129 .
- ♦ The valve seats should only be reworked just enough to produce a perfect seating pattern.
- ♦ Calculate the maximum permissible reworking dimension before reworking.
- ♦ If the reworking dimension is exceeded, the function of the hydraulic tappets can no longer be guaranteed and the cylinder head should be renewed.

Calculating maximum permissible reworking dimension

- Insert valve and press it firmly against valve seat.

Note:

If the valve is to be renewed as part of a repair, use a new valve for the calculation.

- Measure distance between end of valve stem and centre axis of camshaft (centre axis of camshaft is level with top surface of cylinder head).
- Calculate max. permissible reworking dimension from measured distance and minimum dimension.

Minimum dimensions		
Outer inlet valves	Centre inlet valve	Exhaust valves
34.0 mm	33.7 mm	34.4 mm

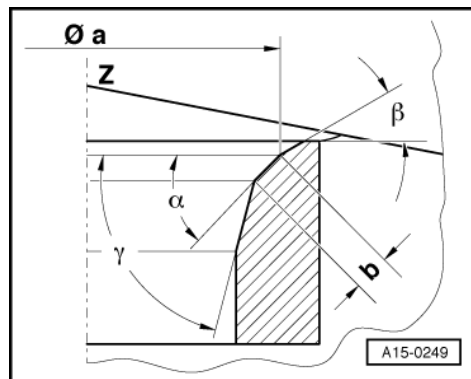
Measured distance minus minimum dimension
= max. permissible reworking dimension.

Example (for outer inlet valve):	
Measured distance	34.4 mm
- Minimum dimension	- 34.0 mm
= Maximum permissible reworking dimension	= 0.4 mm

Note:

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If the maximum permissible reworking dimension is 0 mm or less than 0 mm, repeat the measurement with a new valve. If the measured result is again 0 mm or less than 0 mm, renew the cylinder head.





-> Reworking valve seats

Inlet valve seat
a = 26.2 mm diameter
b = 1.5 ... 1.8 mm
Z = Bottom surface of cylinder head
α = 45° valve seat angle
β = 30° upper correction angle
γ = 60° lower correction angle

Exhaust valve seat
a = 29.0 mm diameter
b = Approx. 1.8 mm
Z = Bottom surface of cylinder head
α = 45° valve seat angle
β = 30° upper correction angle
γ = 60° lower correction angle

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17 - Lubrication

1 - Removing and installing parts of lubrication system

1.1 - Removing and installing parts of lubrication system

Notes:

- ♦ If large quantities of metal shavings or particles are found in the engine oil when repairing the engine, the oil passages must be cleaned carefully, and the oil cooler renewed in order to prevent further damage occurring later.
- ♦ The oil level must not be above the max. mark - danger of damage to catalytic converter.

Viscosity grades and oil specifications

=> Page **152**.

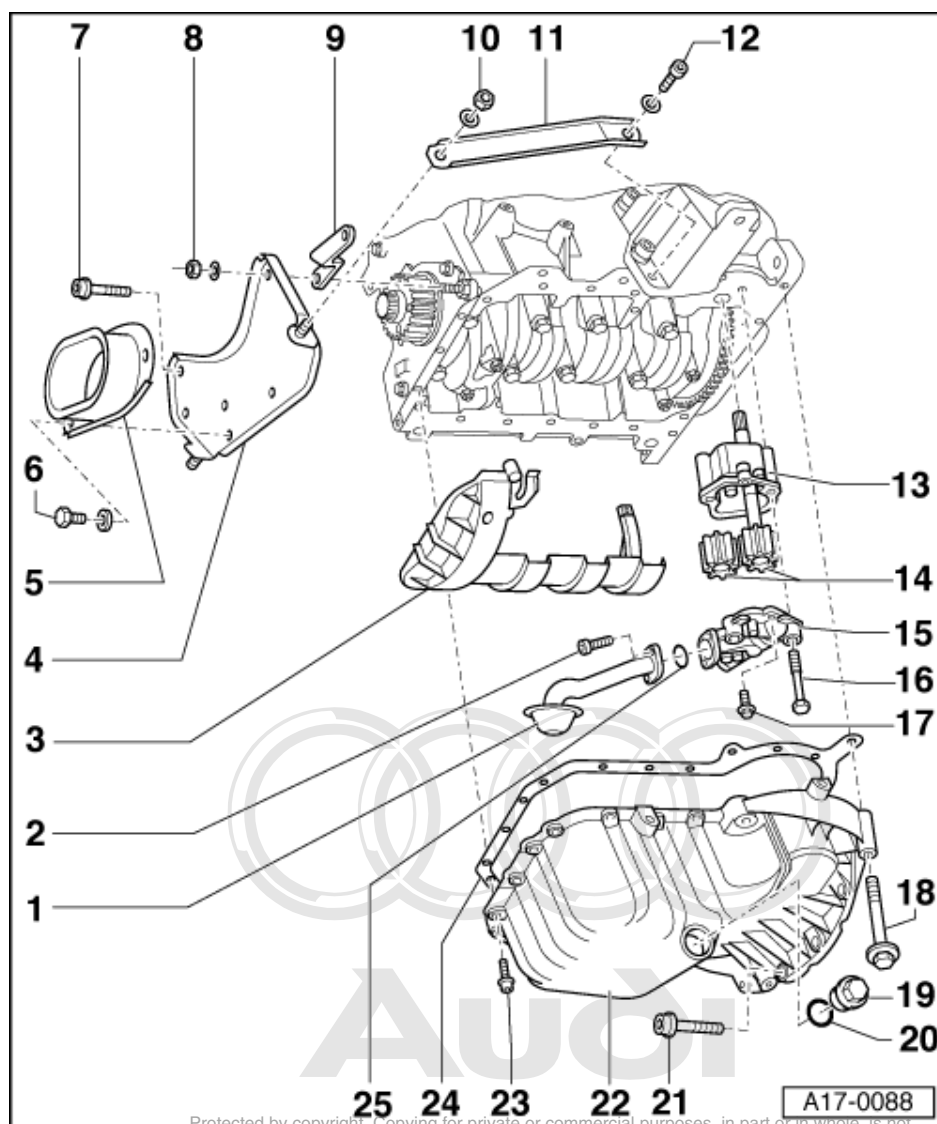
Oil system capacity:

=> Binder "Emissions test"

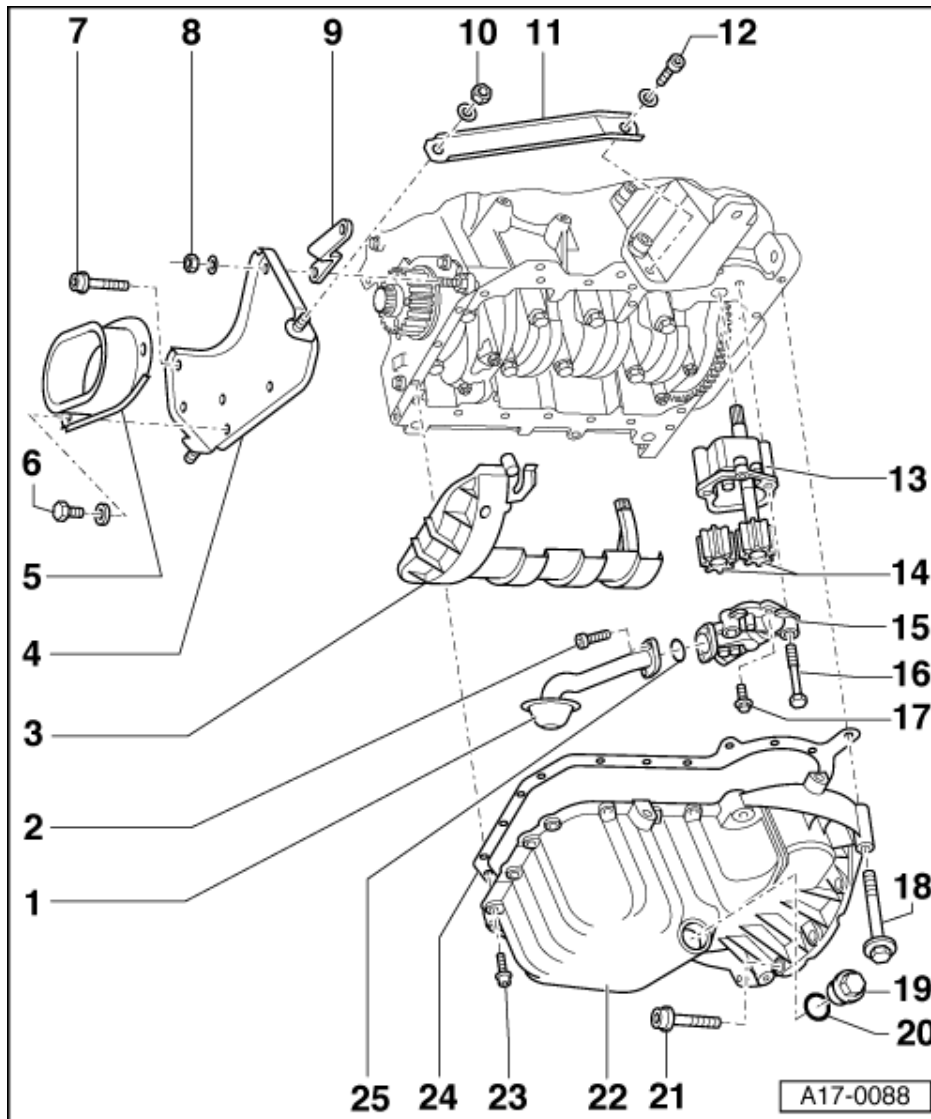
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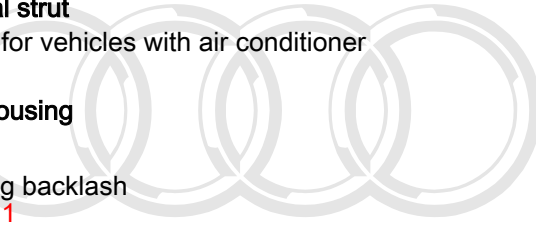
1.2 - Part I



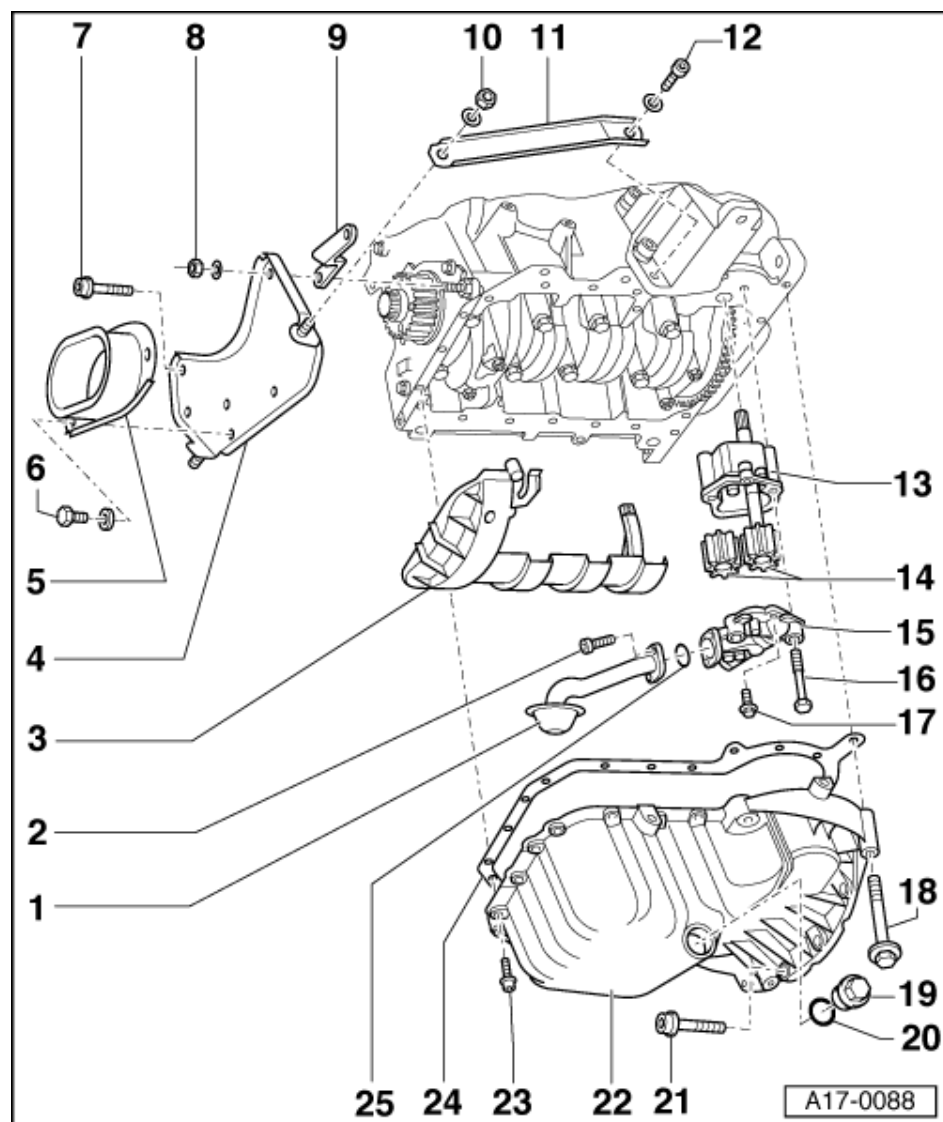
- 1 **Suction pipe**
- ♦ Clean strainer if dirty
- 2 **10 Nm**
- 3 **Baffle plate**
- 4 **Bracket**
- ♦ For torque reaction support
 - ♦ Version for vehicles with air conditioner
- 5 **Stop**
- ♦ For torque reaction support
 - ♦ Adjusting:
 - Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 25 Nm.



- 6 25 Nm
- 7 25 Nm
- 8 25 Nm
- 9 Support
- 10 25 Nm
- 11 Longitudinal strut
 - ♦ Version for vehicles with air conditioner
- 12 20 Nm
- 13 Oil pump housing
- 14 Gears
 - ♦ Checking backlash
=> Fig. 1
 - ♦ Checking axial clearance
=> Fig. 2


Audi

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15 Oil pump cover with pressure relief valve

- ◆ Opening pressure: 5.7...6.7 bar

16 25 Nm

17 10 Nm

18 45 Nm

19 Oil drain plug - 50 Nm

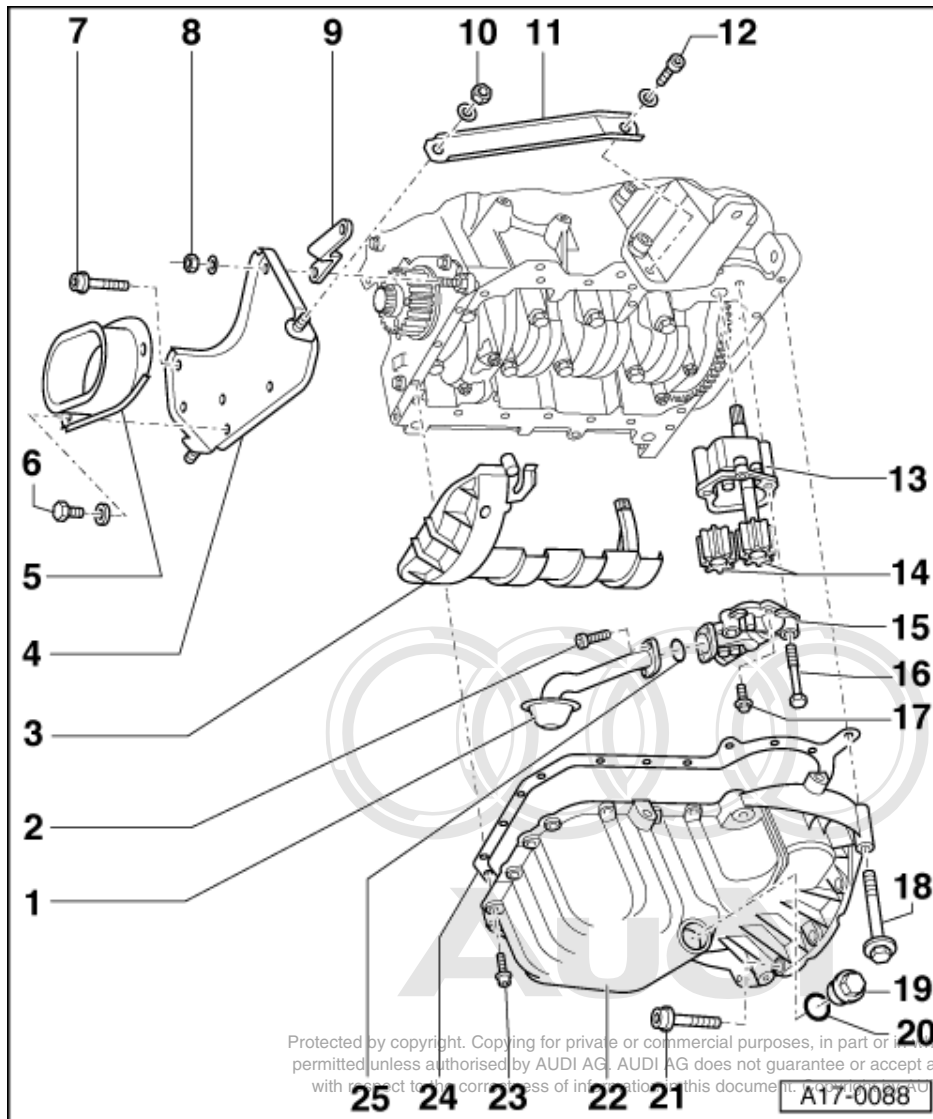
20 Seal

- ◆ Renew

21 M8 - 25 Nm

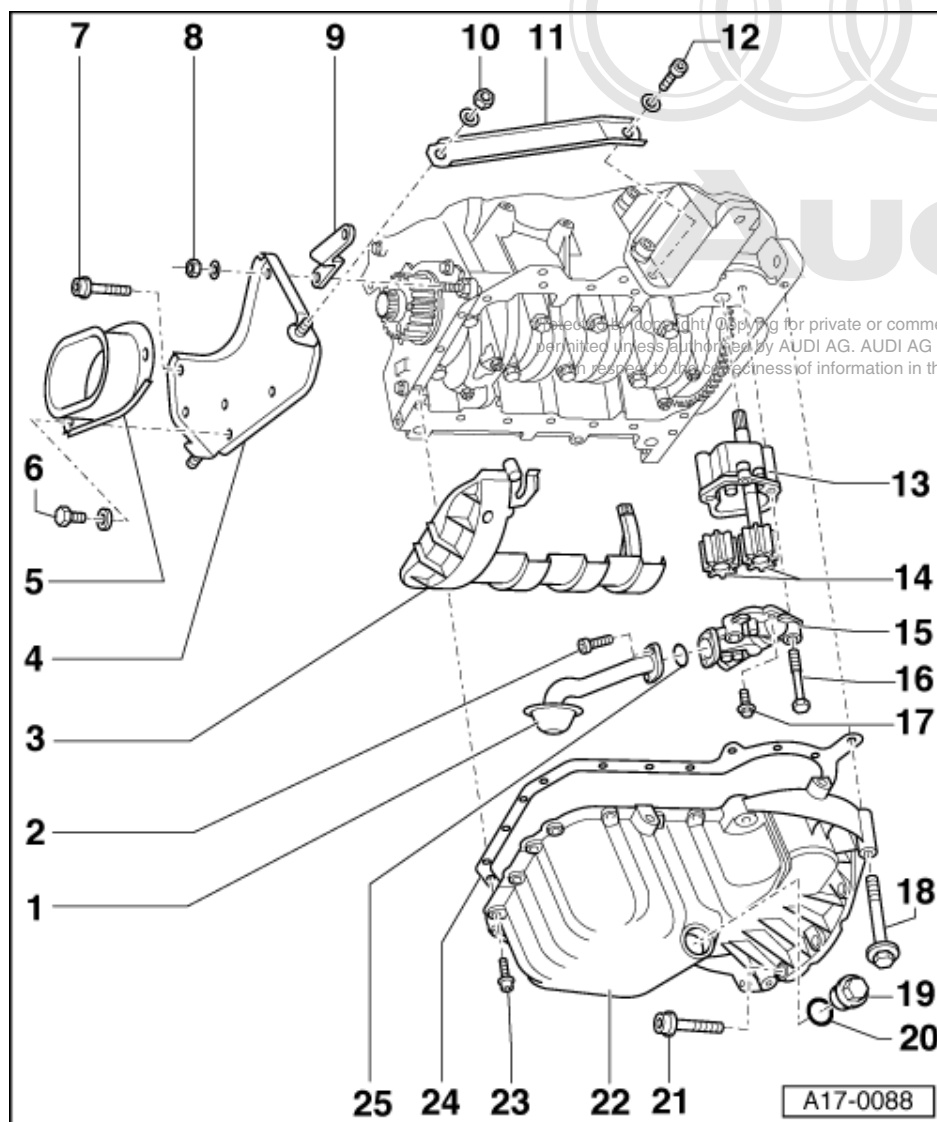
M10 - 45 Nm

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22 Sump

- ♦ Removing and installing
=> Page 143
- ♦ Clean sealing surface before installing
- ♦ When installing sump with engine removed from vehicle, ensure that sump is positioned flush with intermediate plate at flywheel end (i.e. sump should protrude 0.8 mm from cylinder block).
- ♦ Before installing sump, apply a small amount of sealant
"AMV 174 004 01" to sealing points between sealing flange and cylinder block



23 10 Nm

- ♦ Remove and install the two rear bolts (sump/gearbox) with socket attachment 3249
- ♦ Tighten in stages and in diagonal sequence

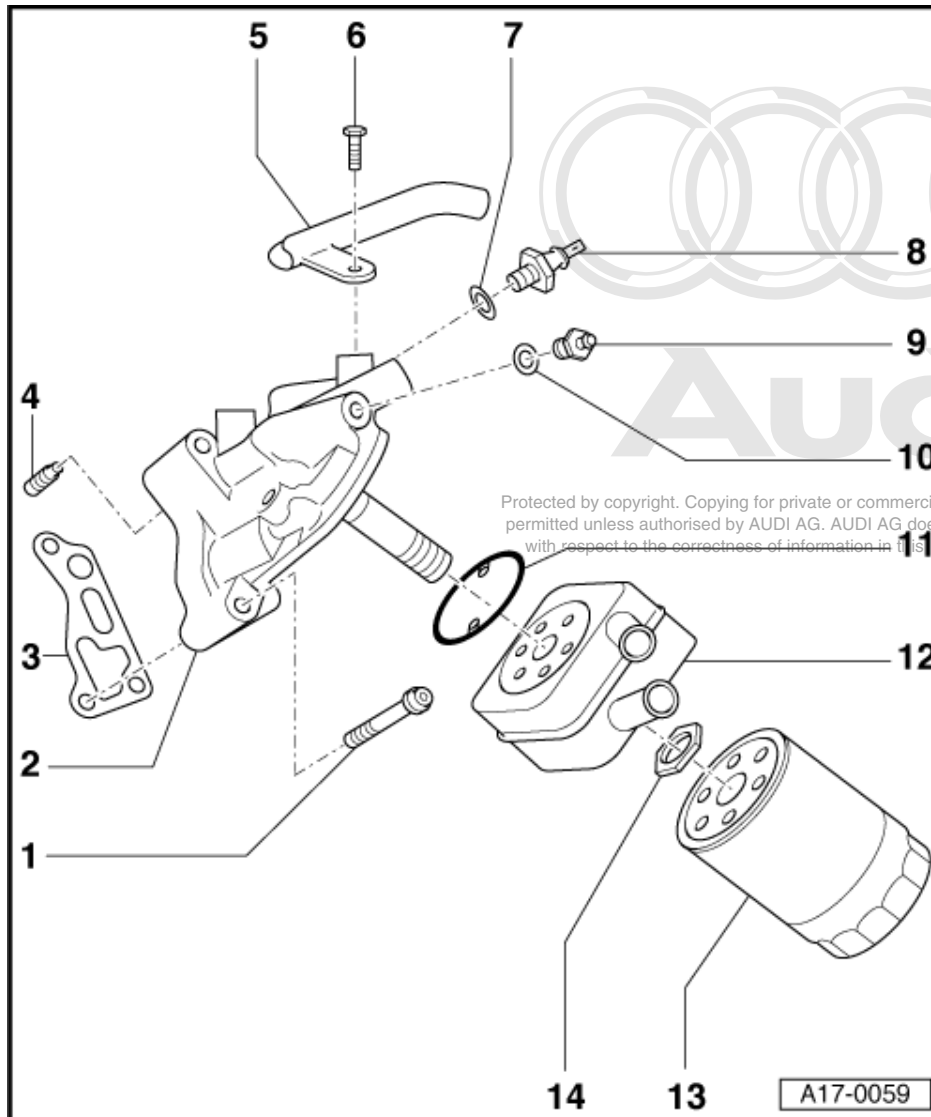
24 Gasket

- ♦ Renew
- ♦ Install dry
- ♦ Apply a small amount of sealant "AMV 174 004 01" only to sealing points between sealing flange and cylinder block (front and rear)

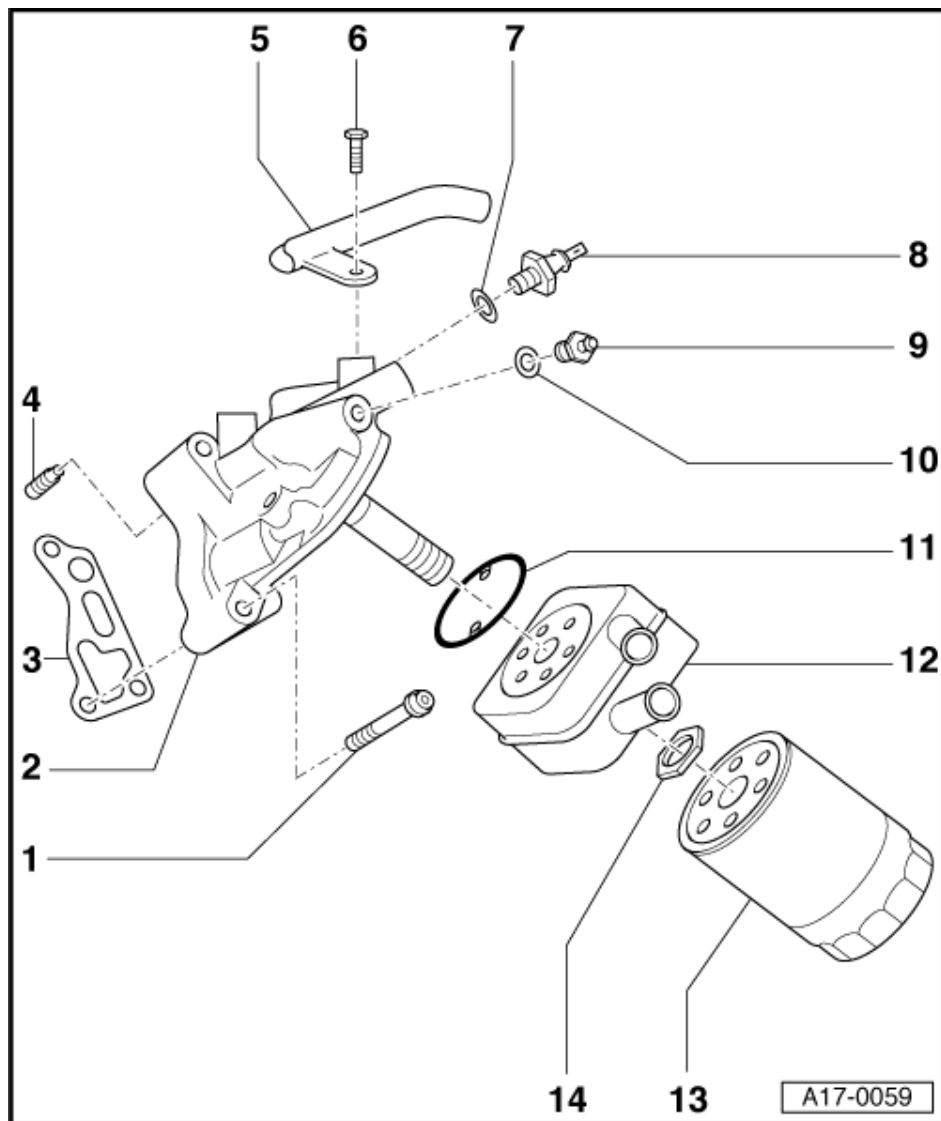
25 O ring

- ♦ Renew

1.3 - Part II



- 1 25 Nm
- 2 Oil filter bracket
- 3 Gasket
 - ♦ Renew
- 4 Oil retention valve
 - ♦ Tighten to 8 Nm
- 5 Bottom coolant pipe
- 6 20 Nm
- 7 Seal
 - ♦ If seal is leaking, cut open and renew.



8 Oil pressure switch -F1, 1.4 bar
-25 Nm

- ◆ Black insulation
- ◆ Checking => Page 150

9 Oil temperature sender -G8
-10 Nm

10 Seal

- ◆ If seal is leaking, cut open and renew.

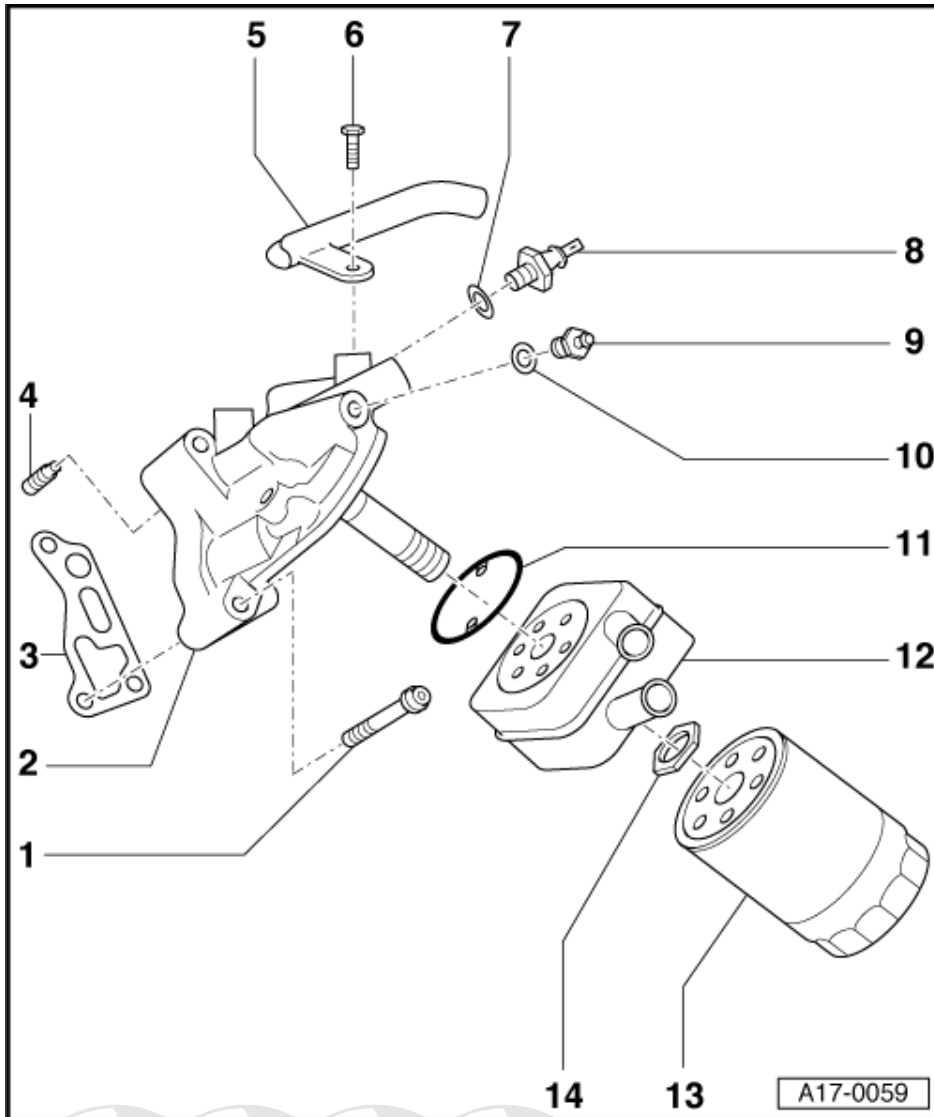
11 Gasket

- ◆ Renew
- ◆ Engage in projections on oil cooler

12 Oil cooler

- ◆ See note
=> Page 133
- ◆ Coolant hose connection diagram => Page 155

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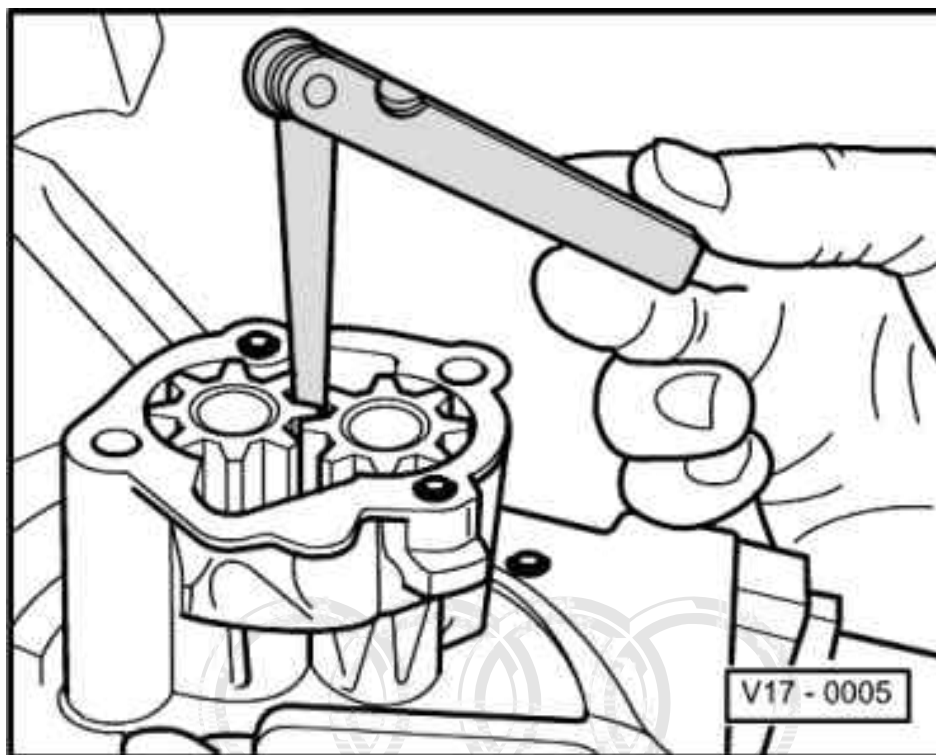


13 Oil filter

- ◆ Observe change intervals
- ◆ Loosen with oil filter wrench 3417
- ◆ Observe installation instructions on oil filter
- ◆ Tighten to 20 Nm

14 25 Nm

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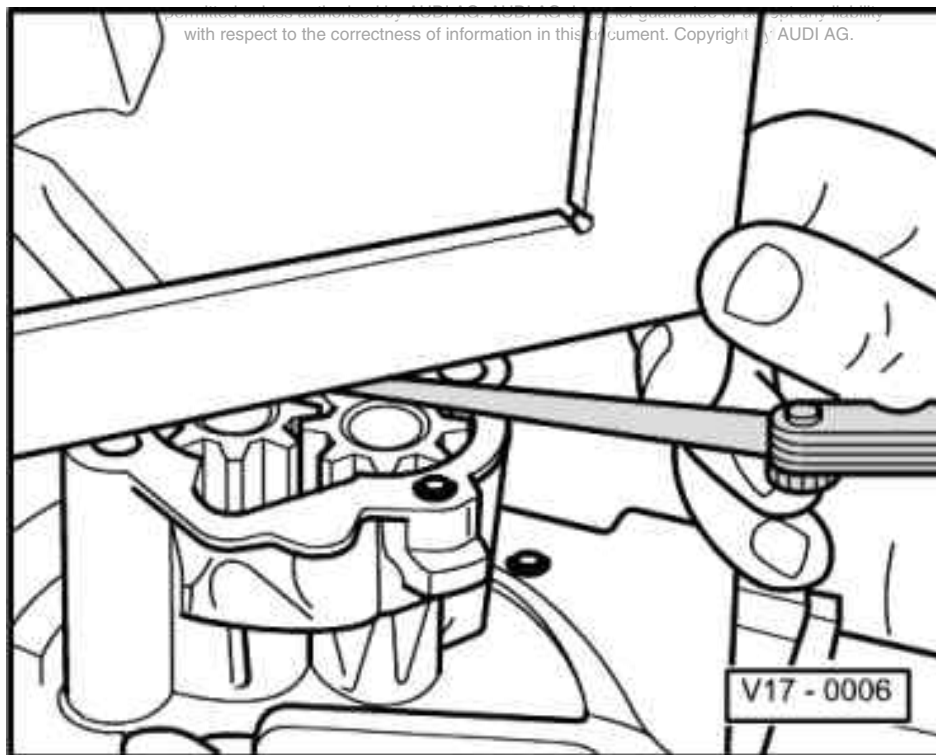


-> Fig. 1 Checking oil pump backlash

New: 0.05 mm

Wear limit: 0.20 mm

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➔ Fig. 2 Checking oil pump axial clearance

Wear limit: 0.15 mm

1.4 - Removing and installing sump

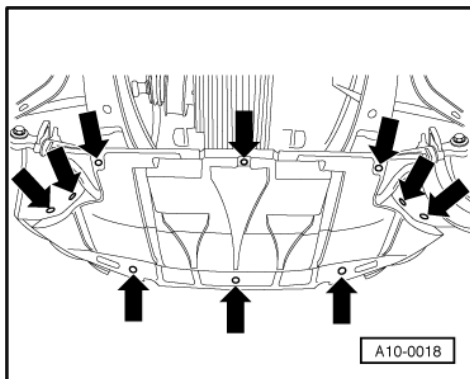
Special tools, testers and auxiliary items

- ◆ Engine support bracket 10-222A with legs 10-222A/1
- ◆ Lifting tackle 2024 A
- ◆ Socket 3249
- ◆ Workshop crane V.A.G 1202 A
- ◆ Sealant AMV174 004 01

Note:

Replace gaskets and seals.

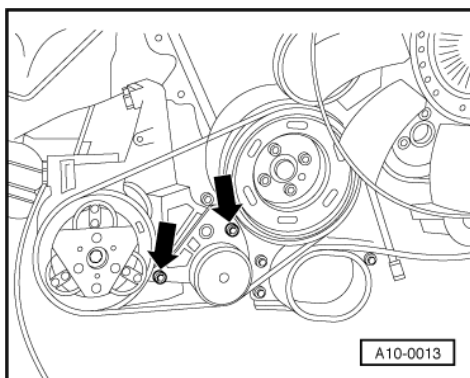
Removing



- ➔ Remove noise insulation -arrows-
- Drain engine oil.

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Vehicles with air conditioner:



Note:

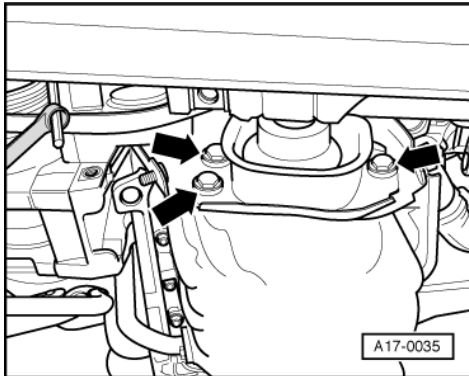
Mark the direction of rotation with chalk or felt pen before removing the ribbed belt. If the belt rotates in the wrong direction when it is refitted, it may break.

- ➔ Loosen securing bolts of tensioning roller for ribbed belt for A/C compressor -arrows-. Slacken belt and remove.



- Remove tensioning roller.

All models

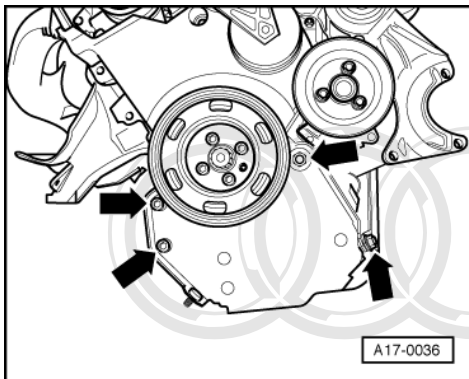


- -> Unbolt stop for torque reaction support -arrows-.

Note:

Illustration shows vehicle with air conditioner.

Vehicles with air conditioner:

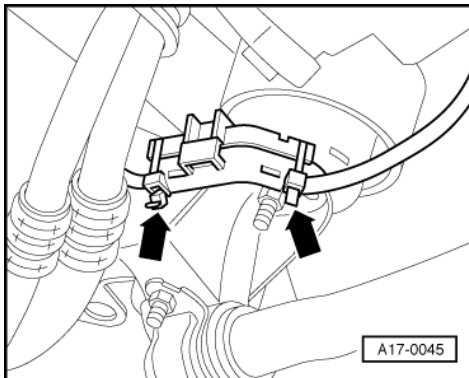


- Unbolt longitudinal strut from bracket (left side).
- -> Unbolt bracket for torque reaction support from engine -arrows-.

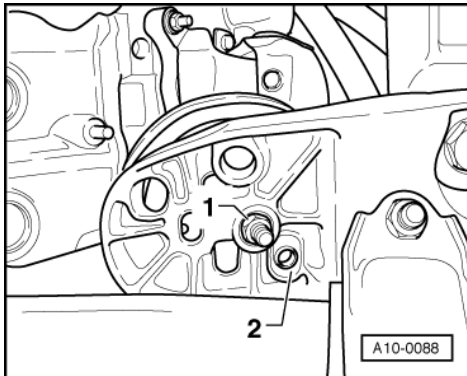
Note:

Shown in illustration with engine removed. For legal purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

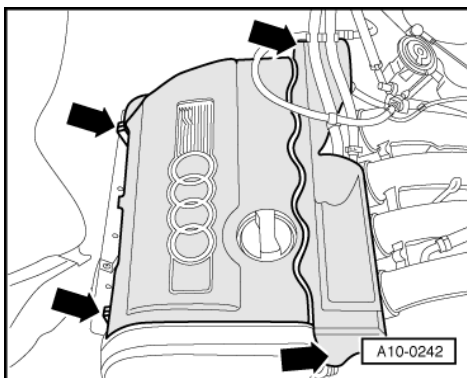
All models



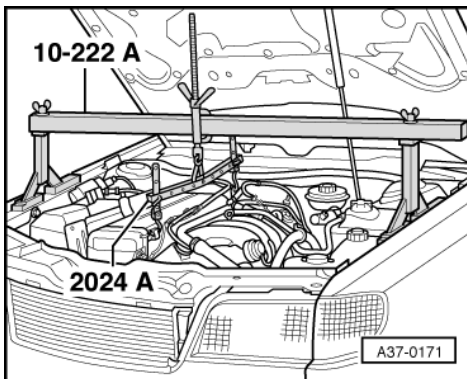
- -> Cut through cable ties -arrows-. Open retainer for starter cable and take out the cable.



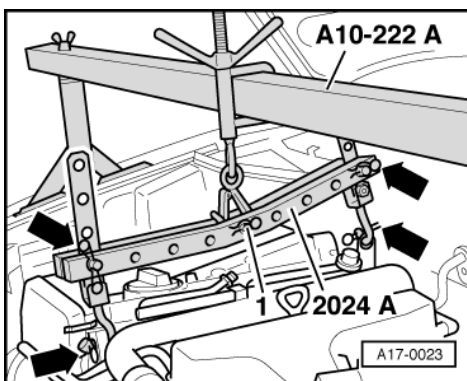
- -> Unbolt both nuts -1- on engine mountings (bottom).



- -> Remove engine cover panels -arrows-.



- -> Set up support bar 10-222 A on wing panel flanges.



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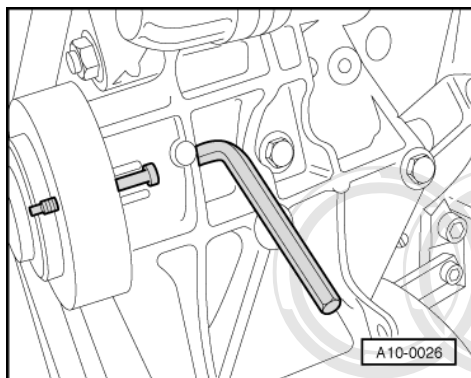
- -> Remove lifting eye from lifting tackle 2024 A.
- Replace pin -1- in centre hole on lifting tackle and secure with locking pin.
- Engage pin on lifting tackle 2024 A on spindle of support bar 10-222 A.
- Engage lifting tackle 2024 A in front and rear lifting eyes on engine.

Important

The hooks and locating pins of the lifting tackle must be secured with locking pins -arrows in illustration-.

- Raise engine as far as possible with spindle of support bar.

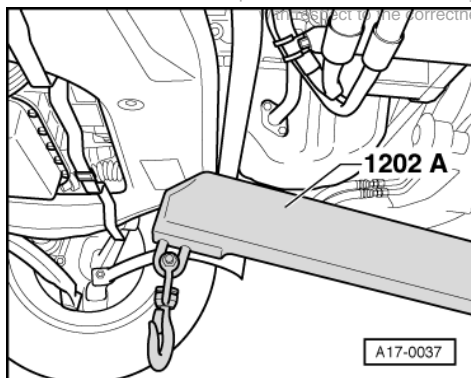
Note:



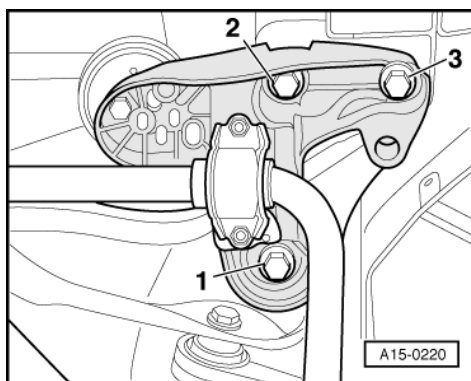
Do not lift engine so far that coolant hoses, pipes or wiring are damaged or stretched. Ensure adequate clearance for viscous fan. If necessary, remove viscous fan as follows.

- Slacken ribbed belt=>Page 36 .
- -> Hold viscous fan pulley in position with M5 x 60 mm bolt and unscrew with 8 mm hexagon key.
- Take off viscous fan and place in fan cowl at the front.

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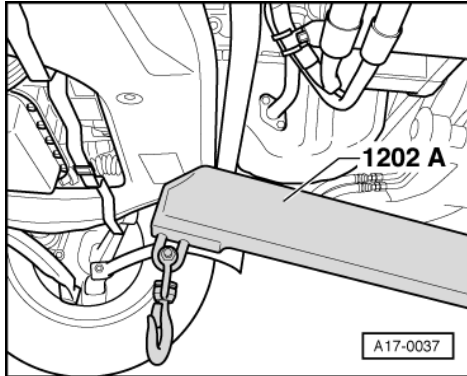
- -> Support subframe with workshop crane V.A.G 1202 A.



- -> First remove front subframe bolts -2- and -3- (left and right). Then unscrew bolts -1-.

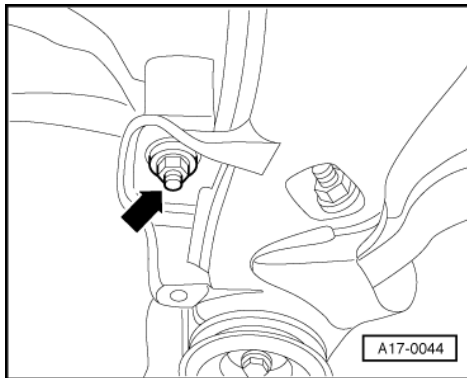
Note:

The subframe should be detached and lowered only at the front, otherwise it will be necessary to check wheel alignment.



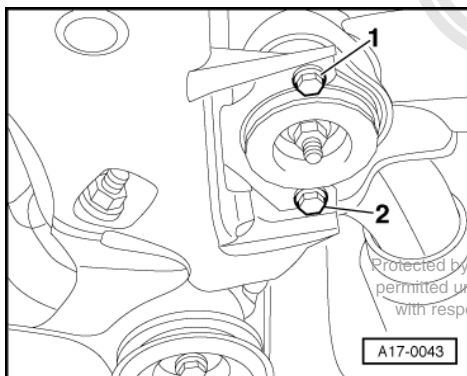
- -> Lower subframe slowly using workshop crane 1202 A.
- Take out workshop crane 1202 A; pivot anti-roll bar downwards.

Vehicles with manual gearbox



- -> Loosen nut -arrow- on left gearbox mounting until it is flush with end of bolt (approx 4 turns on the thread).

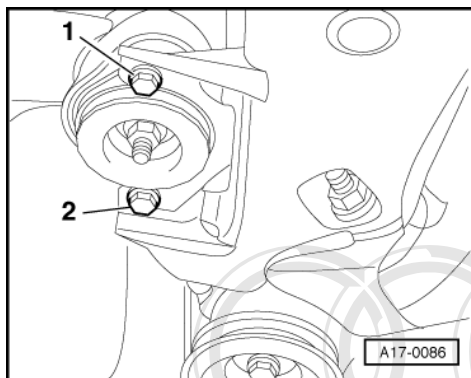
Vehicles with automatic gearbox



- -> Loosen rear bolt -2- on left gearbox mounting a few turns; unscrew and remove front bolt -1- on left gearbox mounting.

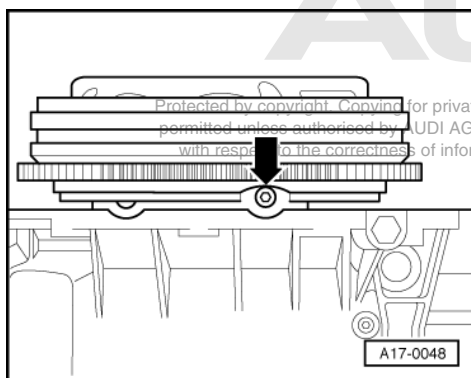


All models



- -> Loosen rear bolt -2- on right gearbox mounting a few turns; unscrew and remove front bolt -1- on right gearbox mounting.

- Unbolt sump.



Notes:

- ♦ -> On vehicles with manual gearbox the two rear sump bolts are accessible via the recess -arrow- on the flywheel (turn flywheel as required).
- ♦ Use socket attachment 3249 to unscrew the rear sump bolts.
- Take off sump: if necessary loosen it by striking lightly with a rubber hammer.

Installing

Installation is carried out in the reverse order, when doing this note the following:

Notes:

- ♦ Renew seals and gaskets.
- ♦ When installing sump with engine removed from vehicle, ensure that sump is positioned flush with intermediate plate at flywheel end (i.e. sump should protrude 0.8 mm from cylinder block).
- Clean sealing surfaces before installing sump.
- Apply a small amount of sealant "AMV 174 004 01" to sides of sealing flanges (front and rear).
- Fit sump and tighten all bolts securing sump to cylinder block to 5 Nm initially.
- Tighten bolts securing sump to gearbox.
- Tighten bolts securing sump to cylinder block in two stages in diagonal sequence.
- Tighten M10 bolts securing sump to cylinder block.
- Install subframe

=> Running gear, front-wheel drive and four-wheel drive; Repair group 40; Removing and installing subframe
 Removing and installing subframe

- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 25 Nm.
- Install ribbed belt =>Page **37** .
- Fill up with engine oil and check oil level.

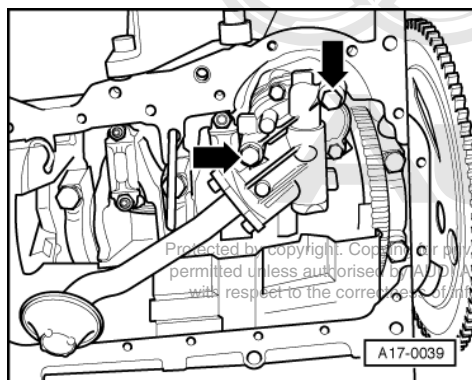
Tightening torques

Component		Nm
Sump to cylinder block	M6	10
	M10	45
Sump to gearbox		45
Engine mounting to subframe		25
Stop for torque reaction support to bracket on engine or lock carrier		25
Bracket for torque reaction support to engine (vehicles with air conditioner)		25
Longitudinal strut to bracket for torque reaction support (vehicles with air conditioner)		25
Longitudinal strut to engine support (vehicles with air conditioner)		20
Oil drain plug		50
Gearbox mounting to subframe		23

1.5 - Removing and installing oil pump

Removing

- Remove sump => Page **143** .
- Disengage and remove baffle plate.



- -> Loosen bolts -arrows-.
- Press subframe downwards and remove oil pump.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Installing sump => Page **148** .



Tightening torque

Component	Nm
Oil pump to cylinder block	25

1.6 - Checking oil pressure and oil pressure switch

Function of dynamic oil pressure warning system

Testing warning lamp

The oil pressure warning lamp lights up when the ignition is switched on ("terminal 15 on") with the engine not running (this does not apply to vehicles with auto-check system).

Conditions for activation of warning

- Engine not running; oil pressure switch closed.
- Coolant temperature below 60°C, engine rpm above 300 rpm and oil pressure switch open.
- Coolant temperature above 60°C, engine speed above 1500 rpm and oil pressure switch open.
- When engine speed is above 5000 rpm an active oil pressure warning is not cancelled, irrespective of the condition of the oil pressure switch.
- If the oil pressure switch is open for longer than 0.5 seconds at engine speeds above 1500 rpm, this condition is stored in the memory. If this condition occurs three times during one journey, the warning will also become active or remain active at engine speeds below 1300 rpm.

Special tools, testers and auxiliary items

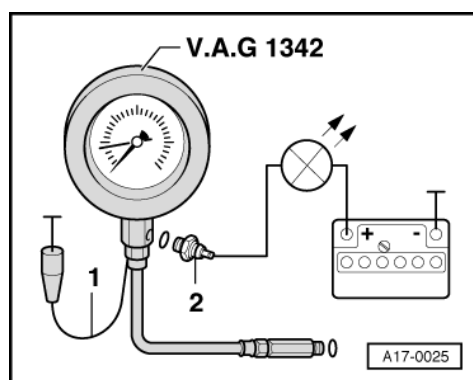
- ♦ Oil pressure tester V.A.G 1342
- ♦ Voltage tester V.A.G 1527 B
- ♦ Adapter set V.A.G 1594 A

Requirements for test:

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- Oil level ok.
- Oil pressure warning lamp -K3 must come on when ignition is switched on.
- In vehicles with auto-check system the "OK" display must appear (call up symbol).
- Engine oil temperature approx. 80 °C

Testing oil pressure switch



- Disconnect wire from oil pressure switch.
- -> Unscrew oil pressure switch and screw in oil pressure tester V.A.G 1342.
- Screw oil pressure switch -2- into V.A.G 1342.
- Connect brown wire -1- of tester to earth (-).
- Connect voltage tester V.A.G 1527 to oil pressure switch and positive side of battery (+) using test leads from V.A.G 1594.
- Test lamp should not light up
- If test lamp lights up, renew oil pressure switch.

- Start engine

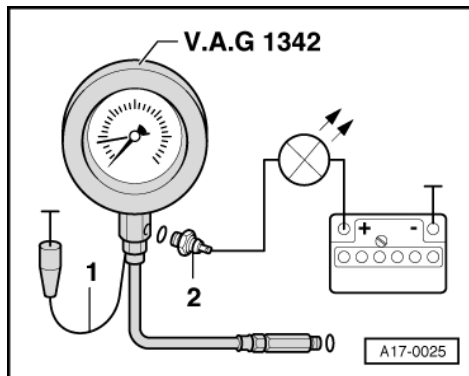
Note:

The switching point of the oil pressure switch can be reached when the engine is cranked on the starter motor, so watch the tester and the test lamp while starting the engine.

- Test lamp should light up at 1.2...1.6 bar.
- If test lamp does not light up, renew oil pressure switch.

Testing oil pressure

- Disconnect wire from oil pressure switch.



- -> Unscrew oil pressure switch and screw in oil pressure tester V.A.G 1342.
- Screw oil pressure switch -2- into V.A.G 1342.
- Start engine (engine oil temperature at least 80°C).
 - Oil pressure at idling speed: 1.0 ... 3.5 bar
 - Oil pressure at 3000 rpm: 5.0 ... 7.0 bar

If the specifications are not obtained:

- Pressure relief valve or oil pump defective; renew oil pump => Page **149**.

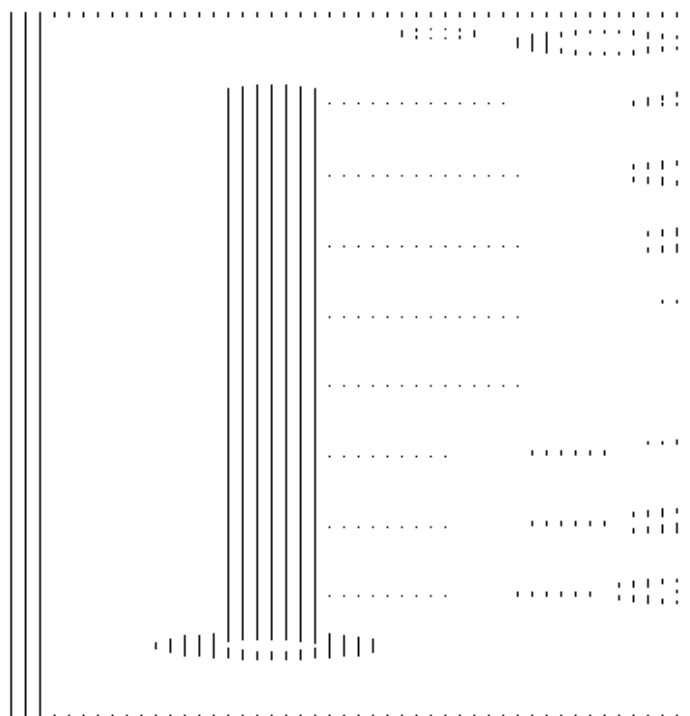
1.7 - Engine oil

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A high-quality multigrade oil is put in at the factory: this can be used all year round, except in extremely cold climates.



Viscosity grades and oil specifications



-> Select the viscosity grade of the oil according to the chart. The oil does not need changing for brief variations of temperature outside the temperature ranges shown.

The specifications listed here must appear on the container - either singly or together with other specifications.

- A - High lubricity multigrade oils, specification VW 500 001)
- B - Multigrade oils, specification VW 501 011)
- Multigrade oils, specification API-SF2) or API-SG2)

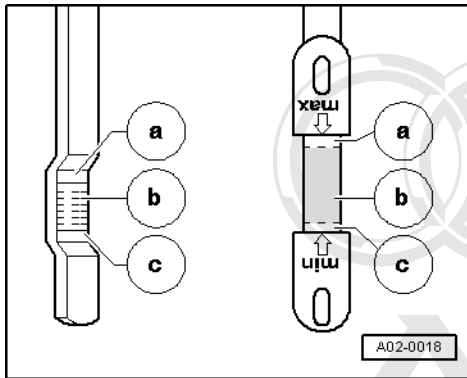
- 1) The date given after the VW specification must be not earlier than 10.91.
- 2) Only use these grades of oil if the approved grades are not available.

Different types of oil may be mixed if necessary when topping up.

1.8 - Checking oil level

Requirements for test:

- Engine oil temperature at least 60 °C
- Vehicle must be level (horizontal)
- After switching off the engine, wait a few minutes to allow the oil to flow back into the sump.
- Pull out the dipstick, wipe off with a clean cloth and insert it again as far as it will go.
- Pull out the dipstick again and read off the oil level.



-> Markings on oil dipstick:

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- a - **Do not top-up oil.**
 - b - Oil can be topped up. The oil level may rise as far as area -a- after topping up.
 - c - Oil must be topped up. It is sufficient if the oil level is somewhere in area -b- (grooved area on dipstick) after topping up.

Note:

The oil level must not be above marking -a- on the dipstick.



19 - Cooling system

1 - Removing and installing parts of cooling system

1.1 - Removing and installing parts of cooling system

Warning!

Hot steam can escape when the cap on the expansion tank is opened. Cover the cap with a cloth, and open it carefully.

Notes:

- ◆ When the engine is warm the cooling system is under pressure. If necessary release pressure before commencing repair work.
- ◆ Secure all hose connections with the correct hose clips (same as original equipment)

=> Parts catalogue

- ◆ V.A.G 1921 hose clip pliers are recommended when installing spring-type clips.
- ◆ Renew all gaskets and seals.
- ◆ The arrow markings on the coolant pipes and on the ends of the hoses must be aligned with each other.



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1.2 - Parts of cooling system

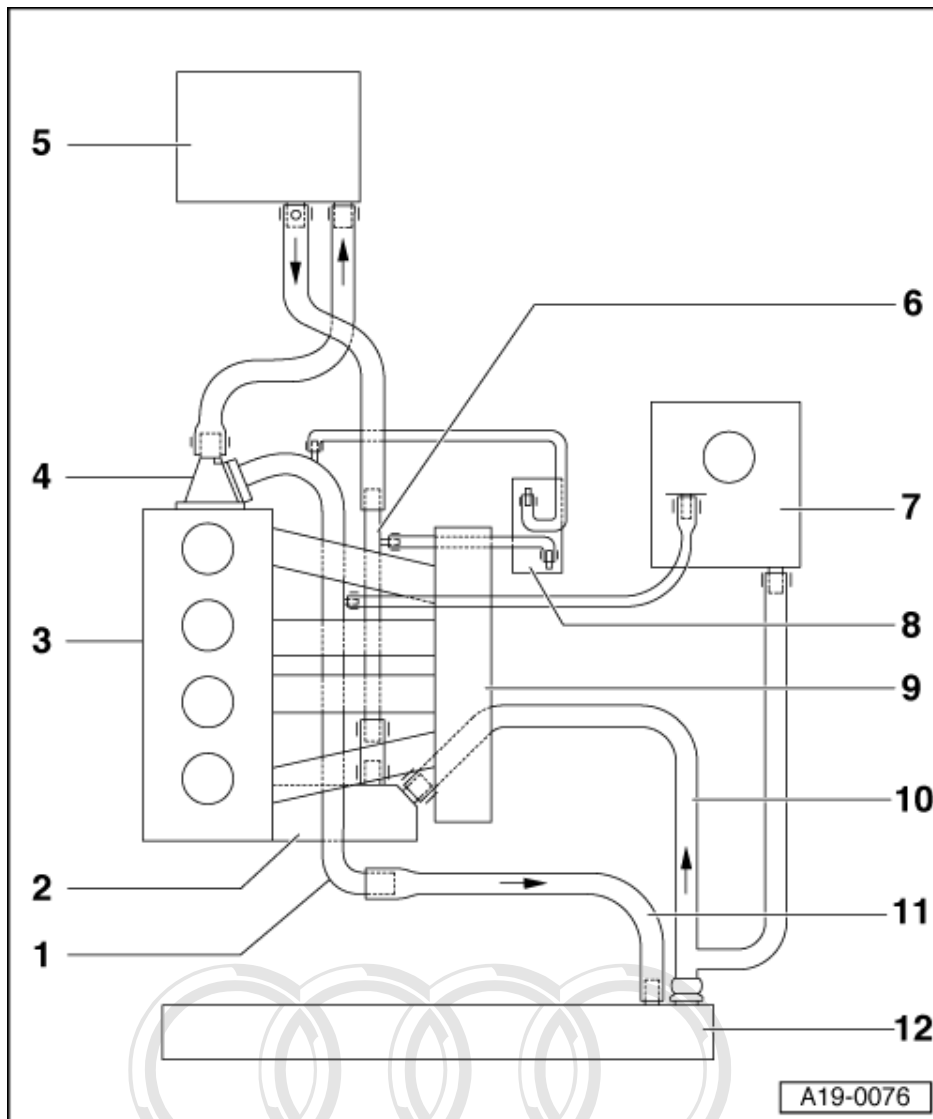
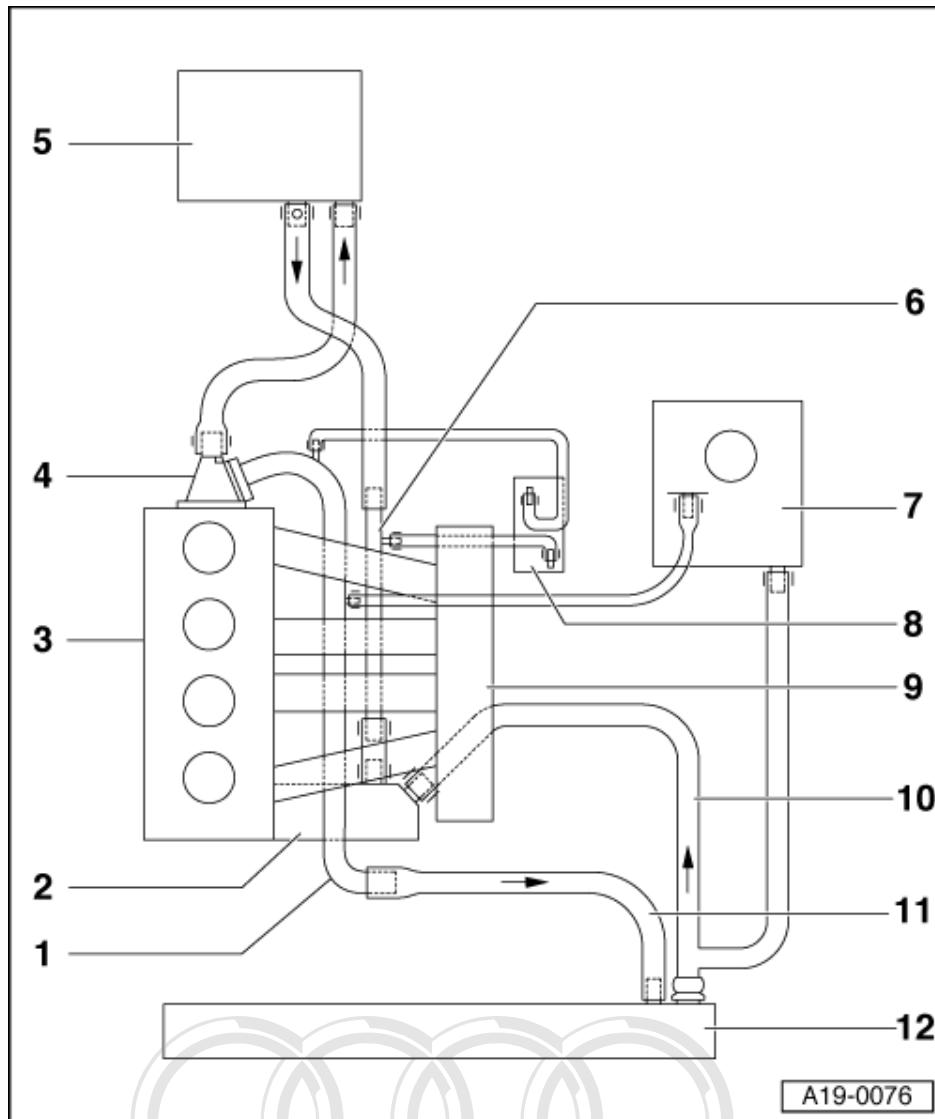
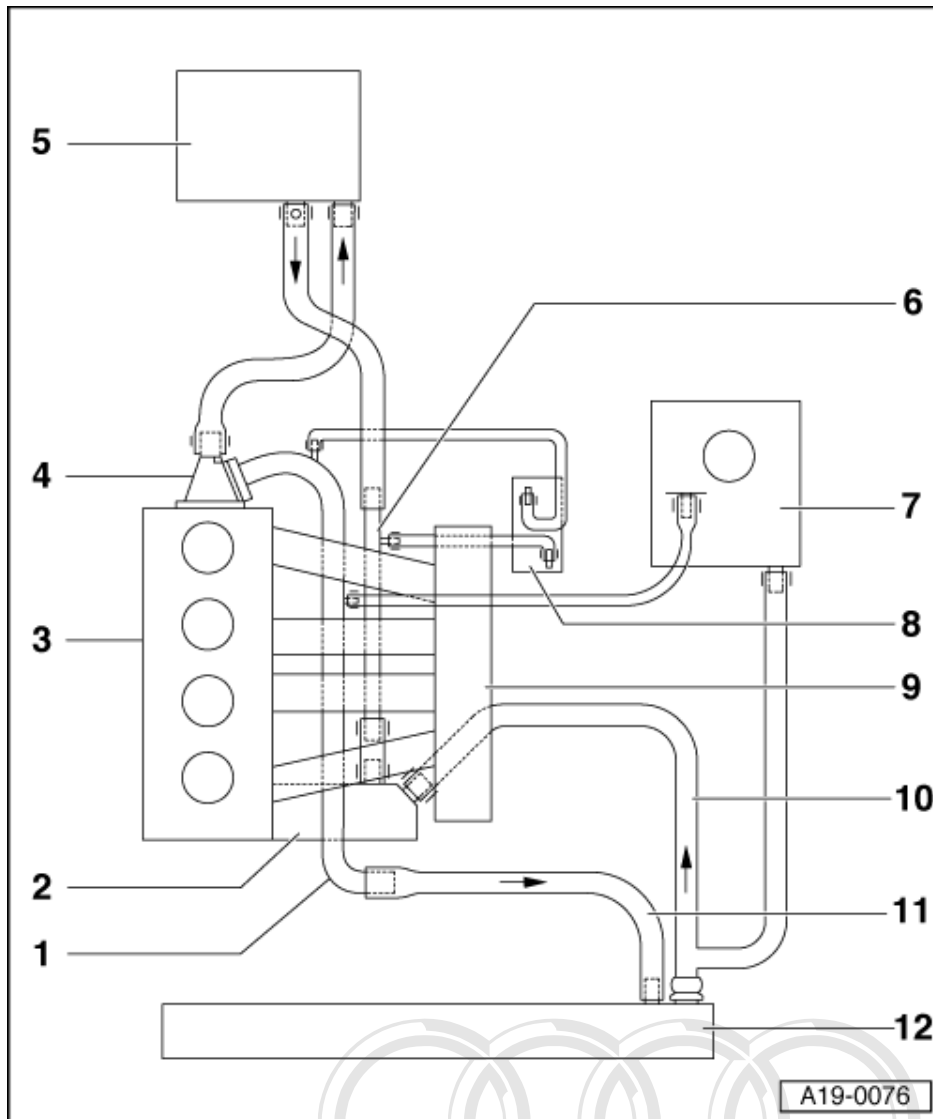


Diagram of coolant hose connections

- 1 Top coolant pipe
- 2 Coolant pump/coolant thermostat
 - ♦ Removing and installing coolant pump => Page 163
 - ♦ Check for ease of movement
 - ♦ Removing and installing coolant thermostat => Page 166
 - ♦ Checking => Page 167
- 3 Cylinder head/cylinder block
 - ♦ After replacing, fill system with fresh coolant
- 4 Connection



- 5 Heat exchanger (for heater)**
- ♦ After replacing, fill system with fresh coolant
- 6 Bottom coolant pipe**
- ♦ Removing and installing
=> Page 168
- 7 Expansion tank**
- ♦ With filler cap
 - ♦ Testing pressure relief valve in filler cap => Page 172
- 8 Oil cooler**
- ♦ Removing and installing
=> Page 140, item 12
- 9 Intake manifold**
- 10 Bottomcoolant hose**



11 Top coolant hose

12 Radiator

- ♦ Removing and installing
=> Page 168
- ♦ After replacing, fill system with fresh coolant

1.3 - Draining and filling cooling system

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Special tools, testers and auxiliary items

- ♦ Drip tray V.A.G 1306
- ♦ V.A.G 1274/10 and adapter V.A.G 1274/1 or V.A.G 1274/8
- ♦ Anti-freeze tester

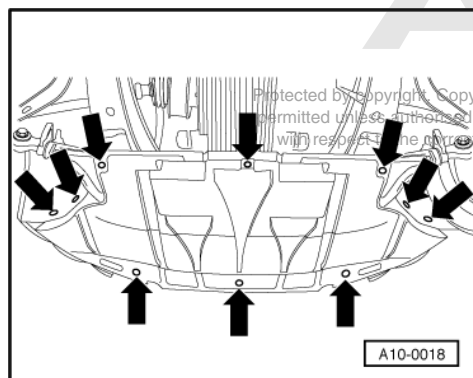


Draining

Note:

Catch drained-off coolant in a clean container for re-use or disposal.

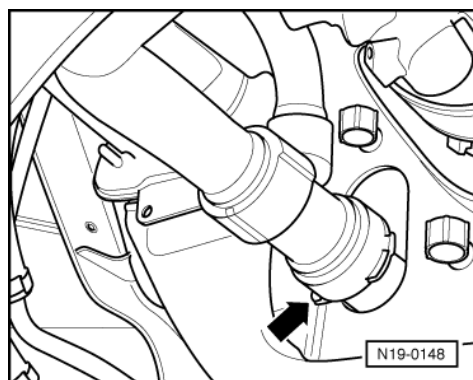
- Open cap on coolant expansion tank.



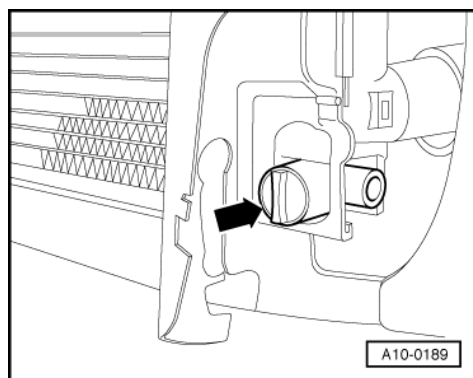
Warning!

Hot steam can escape when the cap on the expansion tank is opened. Cover the cap with a cloth, and open it carefully.

- -> Remove noise insulation -arrows-.

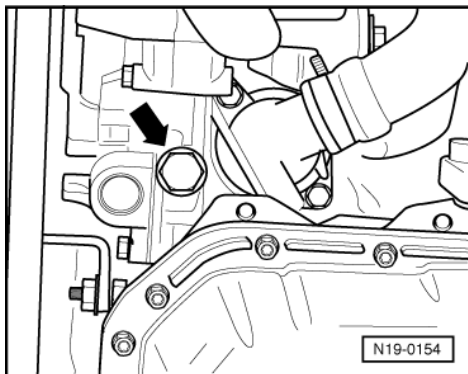


- Place drip tray V.A.G 1306 below engine.
- -> Pull off bottom coolant hose retaining clip -arrow- and remove coolant hose from radiator.



Note:

-> When bumper is removed from vehicle, coolant can also be drained from radiator via drain screw -arrow-.



- -> Unscrew coolant pump drain plug -arrow-.

Filling

Notes:

- ◆ The cooling system is filled all year round with a mixture of water and coolant additive (combined anti-freeze and corrosion protection agent).
- ◆ Coolant additive G 011 A8 C (green) is used in vehicles up to 06.96.
- ◆ Only coolant additive G 012 A8 D (red) is used in vehicles from 07.96 onwards.

Caution
The two different coolant additives G

- ◆ If the fluid in the expansion tank is brown, this means G 012 A8 D has been mixed with another type of coolant. In this case, flush out the cooling system and put in fresh coolant. To flush the system, fill it with clean water and run the engine for about 2 minutes. This should remove very nearly all of the old coolant.
- ◆ G 011 A8 C and G 012 A8 D (and coolant additives marked "meeting specification TL VW 774 C" or "meeting specification TL VW 774 D") prevent frost and corrosion damage, stop scaling and at the same time raise the boiling point of the coolant. For these reasons the cooling system must be filled all year round with the correct anti-freeze and anti-corrosion additive.
- ◆ Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ◆ Anti-freeze protection is required down to about -25 °C (or about -35 °C in countries with arctic climates).
- ◆ The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The anti-freeze ratio must be at least 40 %.
- ◆ If greater frost protection is required in very cold climates, the amount of G 012 A8 D can be increased, but only up to 60 % (this gives frost protection to about -40 °C), as otherwise frost protection is reduced again and cooling effectiveness is also reduced.
- ◆ If radiator, heat exchanger, cylinder head or cylinder head gasket is replaced, do not reuse old coolant.

Recommended mixture ratios:

Anti-freeze protection to	Anti-freeze concentration	Quantity of coolant additive 1)	Quantity of water ¹⁾
-25 °C	40 %	2.4 ltr.	3.6 ltr.
-35 °C	50 %	3.0 ltr.	3.0 ltr.

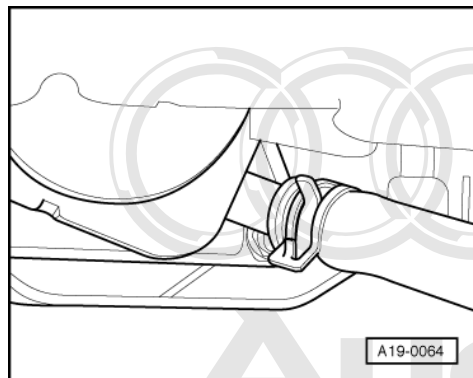
1) Capacity of cooling system: 6.0 litres (may vary depending upon equipment fitted to vehicle)

- Install bottomcoolant hose and secure.



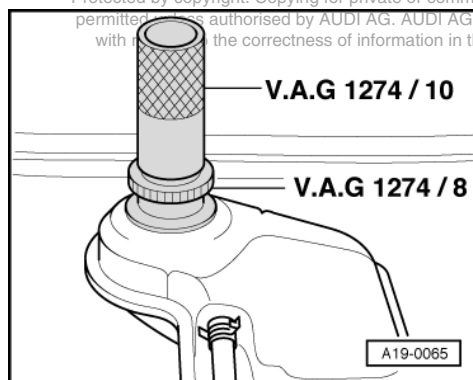
- Replace seal and install coolant pump drain plug (30 Nm)

Vehicles with small filler cap:



- -> Screw adapter V.A.G 1274/1 onto coolant expansion tank.
- Fit special tool V.A.G 1274/10 onto adapter.

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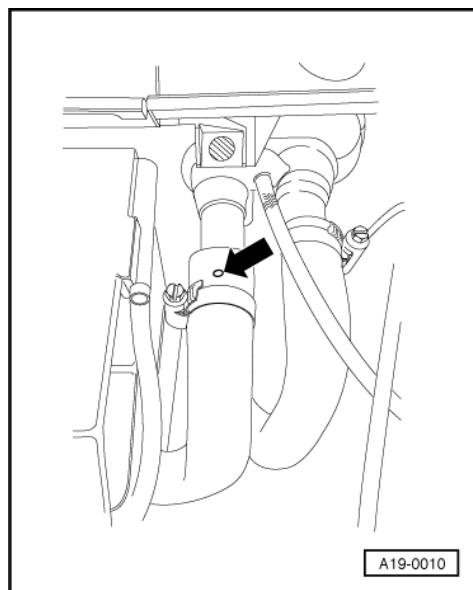
Vehicles with large filler cap:

- -> Screw adapter V.A.G 1274/8 onto coolant expansion tank.
- Fit special tool V.A.G 1274/10 onto adapter.

All models

Note:

To fill expansion tank without special tools, detach expansion tank and raise it about 100 mm.



- Unclip retaining clip securing boot on heat exchanger connection and pull back boot.
- -> Release coolant hose going to heat exchanger and pull back hose until bleeder hole in hose -arrow- is no longer covered by the connection.
- Top up coolant until it flows out at the bleeder hole in coolant hose.
- Push coolant hose on connection and tighten.
- Fit expansion tank cap.

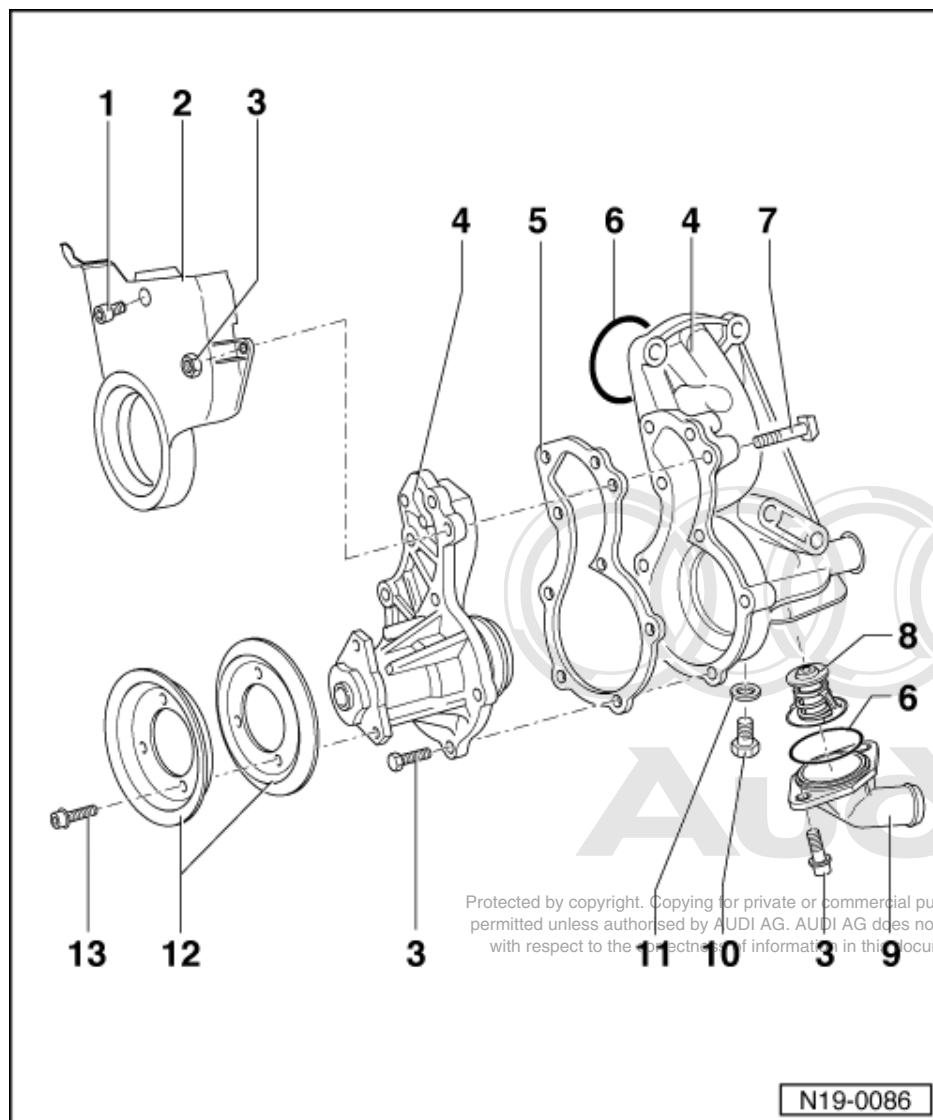
- Start engine and maintain an engine speed of about 2000 rpm for approx. 3 minutes.
- Then allow engine to run at idling speed until the lower hose on radiator becomes hot.
- Check coolant level and top-up if necessary. When the engine is at normal operating temperature, the coolant level must be on the max. mark, when the engine is cold, between the min. and max. marks.

Warning!

Hot steam can escape when the cap on the expansion tank is opened. Cover the cap with a cloth, and open it carefully.

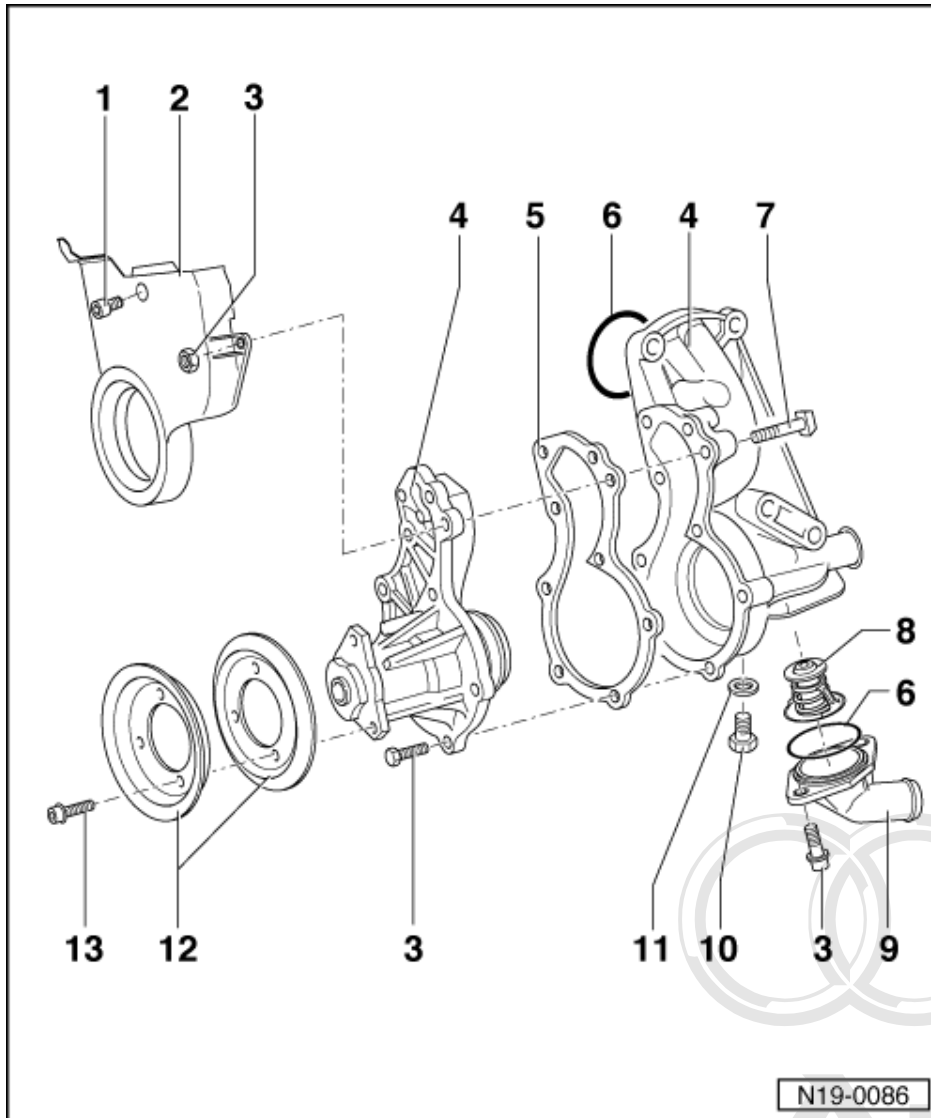
- Stop engine.

1.4 - Removing and installing coolant pump and coolant thermostat



- 1 M6 - 10 Nm
M8 - 20 Nm
- 2 Toothed belt guard - bottom

- ♦ Removing and installing
=> from Page 46
- 3 10 Nm
- 4 Coolant pump
 - ♦ Removing and installing
=>from Page 166
 - ♦ Check that pump runs freely
- 5 Gasket
 - ♦ Renew
- 6 O ring
 - ♦ Renew



- 7 Hammer head bolt
 - ♦ Insert before installing
- 8 Coolant thermostat
 - ♦ Removing and installing
=>Page 166
 - ♦ Checking =>Page 167
- 9 Connection
- 10 Drain plug - 30 Nm
- 11 Seal
 - ♦ Renew

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12 Belt pulley

- ♦ Position: flat section of pulley towards coolant pump

13 25 Nm

1.5 - Removing and installing coolant pump

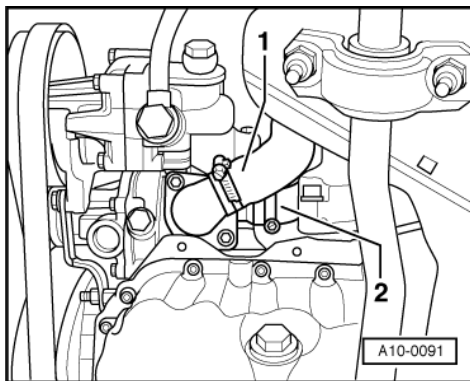
Note:

The coolant pump is bolted to the bracket for the alternator, vane pump and viscous fan.

- Lock carrier must be in service position => Page 19 .

Removing

- Obtain radio code on vehicles with coded radio.
- With ignition switched off, disconnect battery earth strap.
- Remove ribbed belt => Page 36 .
- Remove viscous fan (with belt pulley) => Fig. 35

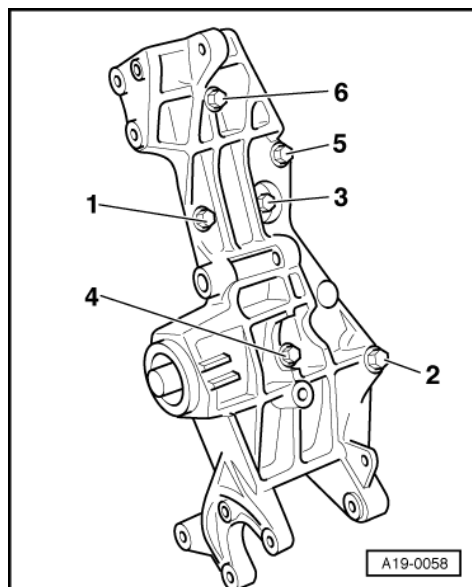


- Remove V-belt => Page 38 .

Note:

Ribbed belt for A/C compressor and torque reaction support need not be removed.

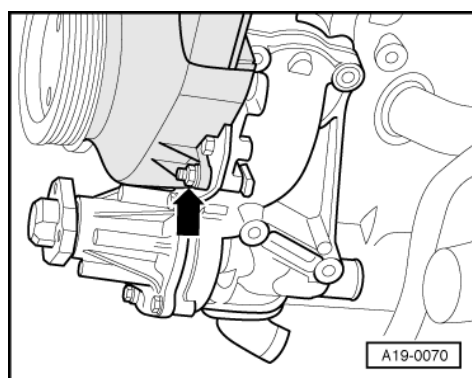
- Draincooling system=> Page 157
- -> Release hose clips on coolant hoses -1- and -2-.
- Disconnect radiator hose at top coolant pipe.
- Unscrew alternator securing bolts.
- Remove alternator from the front.
- Disconnect wiring from alternator after removal.
- Move wiring clear.



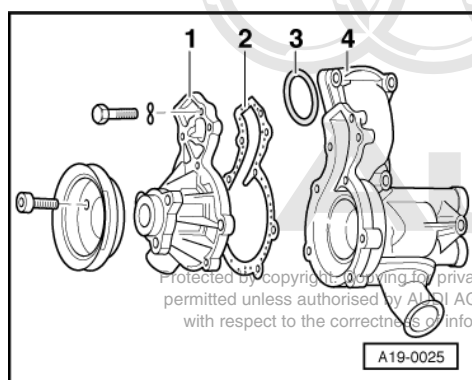
- Unbolt the following supports and struts from bracket for alternator, vane pump and viscous fan:
 - Support for intake manifold
 - Support for torque reaction support bracket
 - Strut to cylinder block (remove complete)
- ➔ Unbolt bracket for alternator, vane pump and viscous fan -bolts 1 ... 6-
- Move bracket for alternator, vane pump and viscous fan clear to the left side and tie up with wire.

Note:

The vane pump does not have to be removed.



- Disconnect coolant hoses from coolant pump and thermostat housing.
- ➔ Unbolt coolant pump housing from toothed belt guard -arrow-.
- Remove coolant pump.



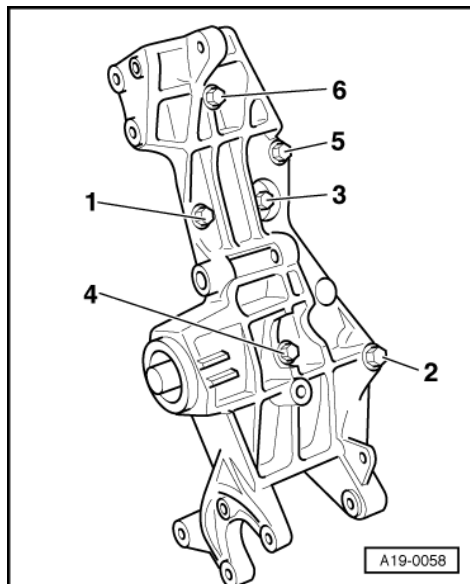
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- -> Unbolt bearing housing -1- from pump housing -4-.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Clean sealing surfaces on both sections of housing.
- Renew gasket and O-ring.
- Insert hammer-head bolt in drilling in coolant pump.



- -> Locate bracket for alternator, vane pump and viscous fan on cylinder block together with coolant pump and tighten the bolts in the sequence indicated below:

- 1 - Bolt M8 x 70
- 2 - Bolt M8 x 110
- 3 - Bolt M8 x 50
- 4 - Bolt M8 x 90
- 5 - Bolt M8 x 70
- 6 - Bolt M8 x 100

- Install viscous fan => Fig. 35 .
- Install ribbed belt =>Page 37 .
- Install V-belt =>Page 38 .
- Fill up with coolant=> Page 159 .

- After connecting battery terminals, program in the radio anti-theft code.

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch function.
- Set clock to correct time.

Tightening torques

Component	Nm
Bearing housing to pump housing	10
Pump housing to toothed belt guard	10
Bracket for alternator, vane pump and viscous fan to cylinder block	25

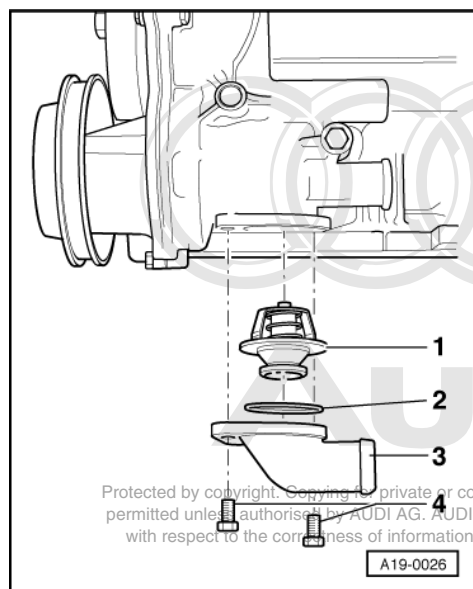
Component	Nm
Strut on cylinder block (left) / bracket for alternator, vane pump and viscous fan to cylinder block	25
to bracket M10	40

Component	Nm
Strut for torque reaction support / bracket for al- ternator, vane pump and viscous fan to torque reaction support	25
to bracket	20
Support for intake manifold to intake manifold	20
to bracket	20
Alternator to bracket for alternator, vane pump and viscous fan M8	25
M10	40
Pulley to coolant pump	25
Viscous fan to bearing	45

1.6 - Removing and installing, checking coolant thermostat

Removing

- Drain cooling system=> Page 157



- Unscrew bolts -4- and remove connection -3-, O-ring -2- and coolant thermostat -1-.

Installing

- Clean and smooth down sealing surface for O-ring as required.
- Insert coolant thermostat.

- Fill up with coolant=> Page 159 .

Tightening torque

Component	Nm
Connection to pump housing	10

Testing coolant thermostat

- Heat thermostat in water bath.

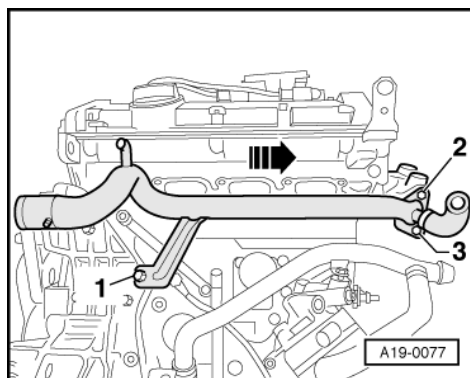
Starts to open	Fully open	Opening travel
approx. 87°C	approx. 102°C 1)	at least 8 mm

- 1) cannot be tested

1.7 - Removing and installing top coolant pipe

Removing

- Drain cooling system=> Page 157
- Remove intake manifold => Page 89 .



- Detach coolant hoses from top coolant pipe.
- -> Unbolt top coolant pipe from coolant flange at back of cylinder head (bolts -2- and -3-).
- Slacken front bolt -1- on top coolant pipe a few turns and push coolant pipe towards rear of vehicle -arrow-.
- Take off top coolant pipe.

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Installing

Installation is carried out in the reverse order, when doing this note the following:

Note:

Replace O-ring.

- Install intake manifold=>Page 93 .
- Fill up with coolant=> Page 159 .

Tightening torque

Component	Nm
Top coolant pipe to flange	10

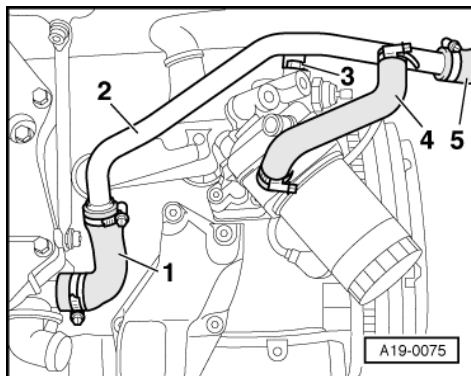


Component	Nm
Top coolant pipe to bracket	25

1.8 - Removing and installing bottom coolant pipe

Removing

- Drain cooling system=> Page 157



- -> Disconnect hose -4- (going to oil cooler) from bottom coolant pipe -2-.
- Disconnect hose -5- (going to heat exchanger) from bottom coolant pipe.
- Detach bottom coolant pipe from hose -1- going to coolant pump.
- Unbolt bottom coolant pipe from oil filter bracket -3-.

Installing

Installation is carried out in the reverse order, when doing this note the following:

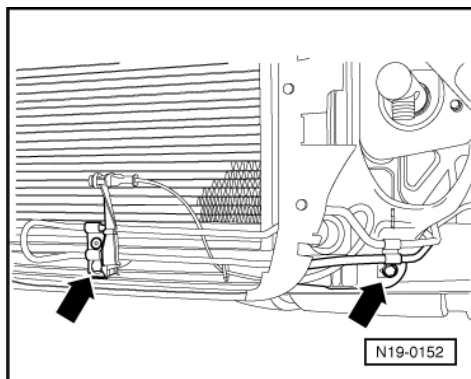
- Install intake manifold=>Page 93 .
- Fill up with coolant=> Page 159 .

Tightening torque

Component	Nm
Bottom coolant pipe to oil filter bracket	20

1.9 - Removing and installing radiator

Special tools, testers and auxiliary items



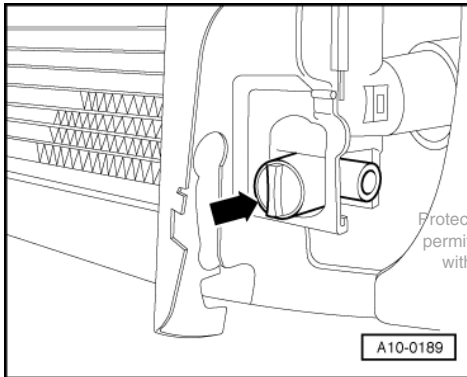
- ♦ Drip tray V.A.G 1306

Removing

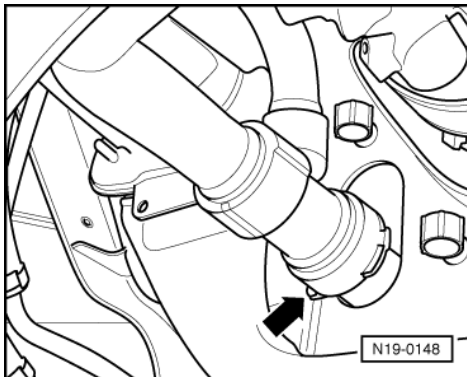
- Remove front bumper:

=> General body repairs; Repair group 63; Front bumper; Removing and installing front bumper Front bumper
 Removing and installing front bumper

- -> Detach cooling pipes for power steering hydraulic fluid -arrows-.
- Place drip tray V.A.G 1306 below engine.
- Open cap on coolant expansion tank.



- -> Turn drain screw -arrow- on radiator towards the left, if necessary fit drain hose to connection.



- -> Pull coolant hoses off radiator (release retaining clip on connecting flange -arrow-).

Vehicles with automatic gearbox

- Removing ATF pipes/hoses from radiator:

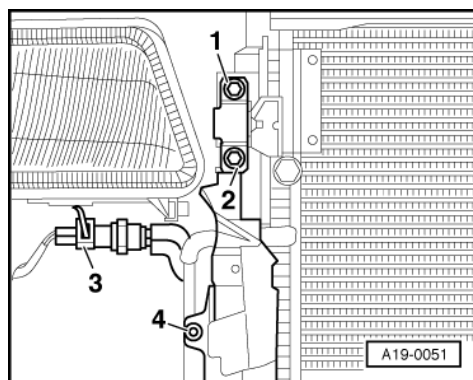
=> Automatic gearbox 01N; Repair group 37; Dismantling and assembling gearbox; Removing and installing ATF pipes Dismantling and assembling gearbox Removing and installing ATF pipes

Vehicles with air conditioner:

Warning!
 The air conditioner refrigerant circuit must not be opened.

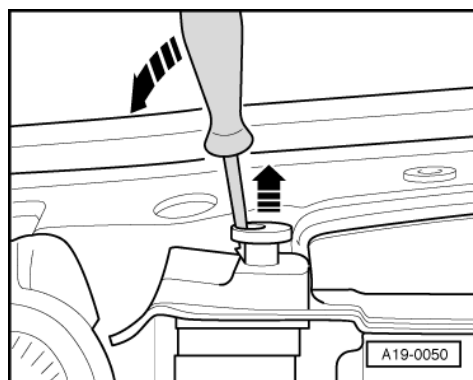


Note:



To prevent damage to the condenser and refrigerant pipes/hoses, ensure that the pipes and hoses are not stretched, kinked or bent.

- -> Detach air cowls from radiator -4- (left and right).
- Remove securing bolts -1- and -2- for condenser.
- Unplug connector -3- from air conditioner pressure switch -F129.
- Pull condenser up out of its bracket, pivot towards the side and secure to right-hand front wheel with wire.



Note:

Protect wing panel from damage.

All models

- -> Release two retaining pins for radiator and pull out upwards
-arrows-.
- Pivot radiator towards the front and lift out.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Fill up with coolant=> Page 159 .

Tightening torques

Component	Nm
Condenser to radiator	10



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Component	Nm
Cooling pipes to radiator	10

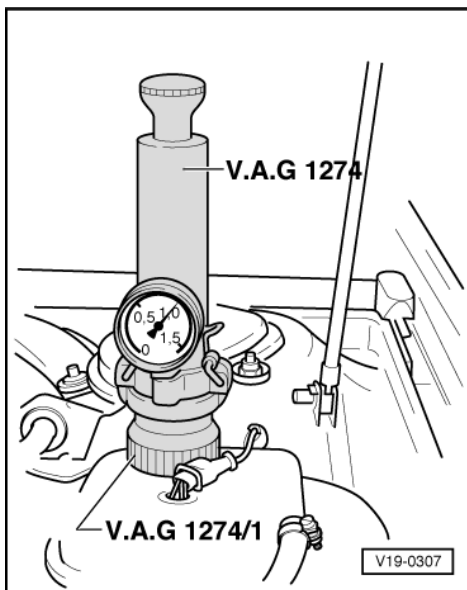
1.10 - Checking cooling system for leaks

Special tools, testers and auxiliary items

- ◆ Cooling system tester V.A.G 1274
- ◆ Adapter V.A.G 1274/1or
V.A.G 1274/8 and V.A.G 1274/9

Test requirement:

- Engine at operating temperature.



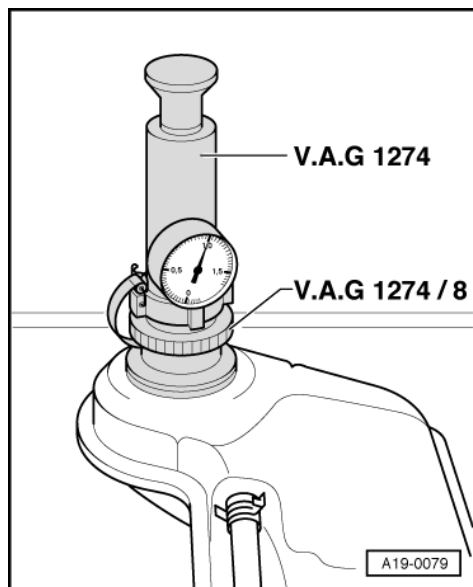
Warning!

Hot steam can escape when opening cap on expansion tank: Cover cap with a cloth and open carefully.

- Open cap on coolant expansion tank.

Vehicles with small filler cap:

- -> Fit tester V.A.G 1274 with adapter V.A.G 1274/1 onto expansion tank.



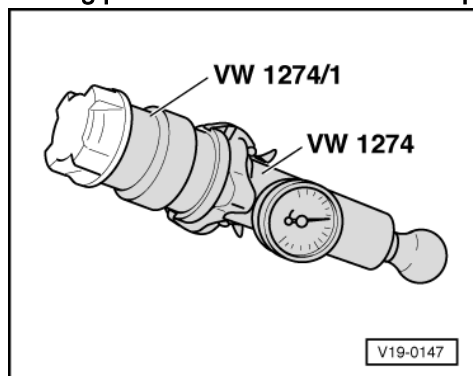
Vehicles with large filler cap:

- -> Fit tester V.A.G 1274 with adapter V.A.G 1274/8 onto expansion tank.

All models

- Using hand pump on tester, build up a pressure of approx. 1.0 bar.
- If pressure is not maintained, trace leak and rectify fault.

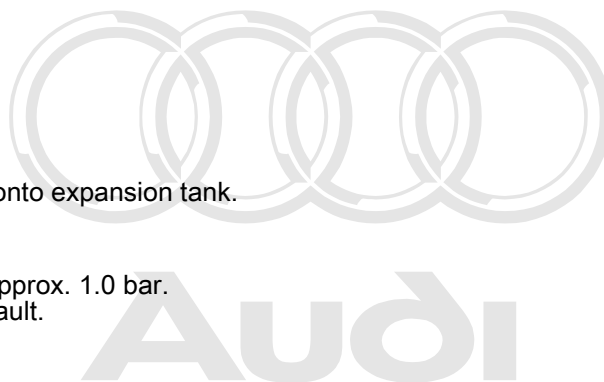
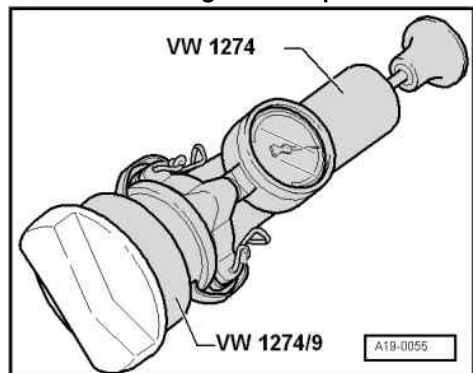
Testing pressure relief valve in filler cap.



Vehicles with small filler cap:

- -> Fit tester V.A.G 1274 with adapter V.A.G 1274/1 (2 parts) onto filler cap.
- Operate hand pump.
- Pressure relief valve must open at 1.2 ... 1.5 bar.

Vehicles with large filler cap:



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- -> Fit tester V.A.G 1274 with adapter V.A.G 1274/9 onto filler cap.
- Operate hand pump.
 - Pressure relief valve must open at 1.4 ... 1.6 bar.



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20 - Fuel supply system

1 - Removing and installing parts of fuel supply system

1.1 - Removing and installing parts of fuel supply system

Notes:

- ♦ Secure all hose connections with the correct hose clips (same as original equipment)

=> Parts catalogue

- ♦ All adhesive tape fastenings which are taken off when removing components must be re-attached in the same position when installing.
- ♦ Hose clip pliers V.A.G 1921 are recommended when installing spring-type clips.
- ♦ Always renew sealing rings and gaskets when assembling.

Observe safety precautions

=> Page 174

Observe rules for cleanliness

=> Page 175

Checking fuel pump relay and activation:

=> Motronic injection and ignition system (4-cylinder); Repair group 24; Servicing Motronic injection and ignition system; Testing fuel pump relay and activation

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=> Motronic injection and ignition system (4-cylinder) 07.96 ä; Repair group 24; Testing fuel pump relay Testing fuel pump relay

1.2 - Safety precautions when working on the fuel supply system

Warning!

Fuel system is under pressure! Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

Note the following points when removing and installing the fuel gauge sender or fuel pump (fuel delivery unit) in the fuel tank:

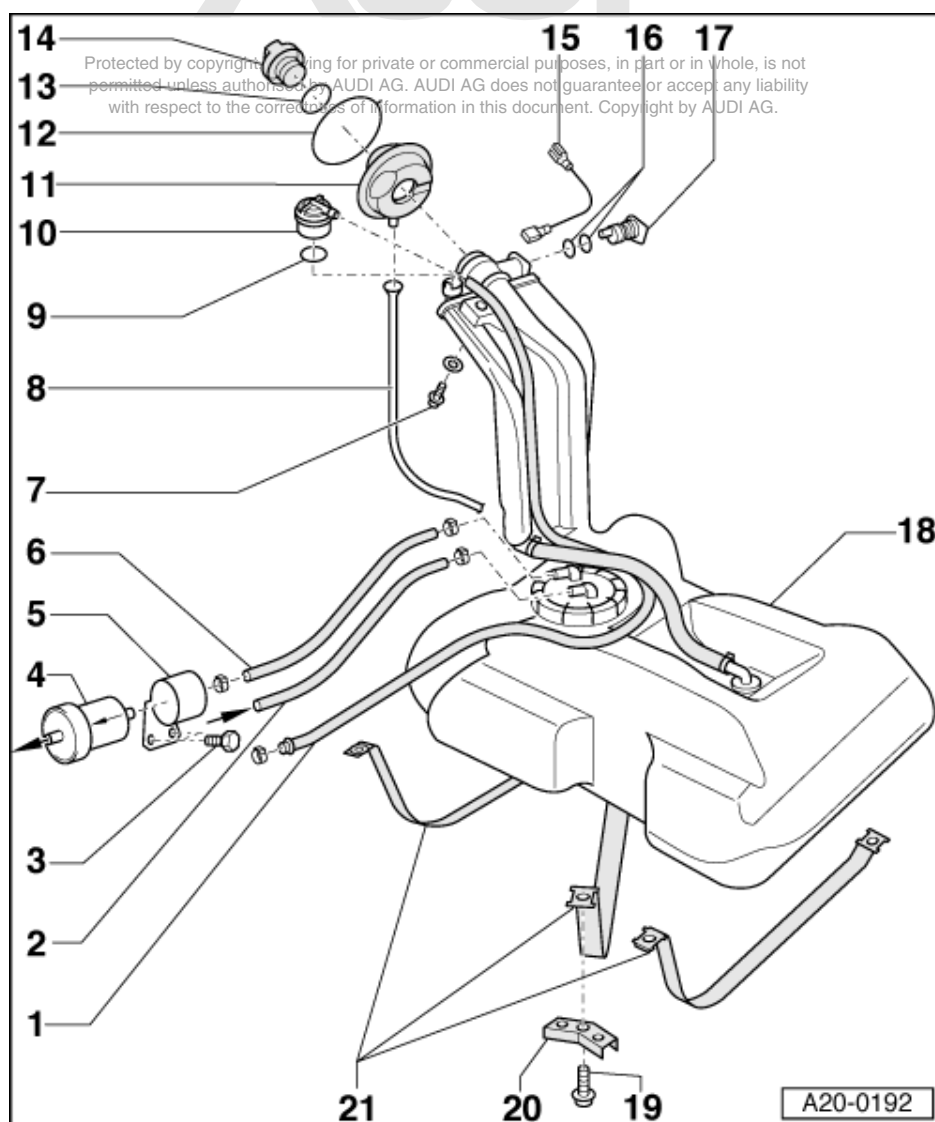
- ♦ The fuel tank must not be more than 1/3 full. If necessary, draw off excess fuel with extractor V.A.G 1433 A.
- ♦ Before commencing work, switch on exhaust extraction system and place an extraction hose close to the sender opening in the fuel tank to extract escaping petrol fumes.
If no exhaust extraction system is available, a radial fan (as long as motor is not in air flow) with a displacement greater than 15 m³/h can be used.
- ♦ Prevent skin contact with petrol. Wear fuel-resistant gloves.

1.3 - Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following "5 rules":

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover. Do not use fluffy cloths!
- ◆ Carefully cover or seal opened components if the repair cannot be carried out immediately.
- ◆ Only install clean components:
Only unpack replacement parts immediately prior to installation.
Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ◆ When the system is open:
Do not work with compressed air if this can be avoided.
Do not move vehicle unless absolutely necessary.

1.4 - Removing and installing fuel tank with its attachments and fuel filter (vehicles with front-wheel drive)



1 Breather pipe

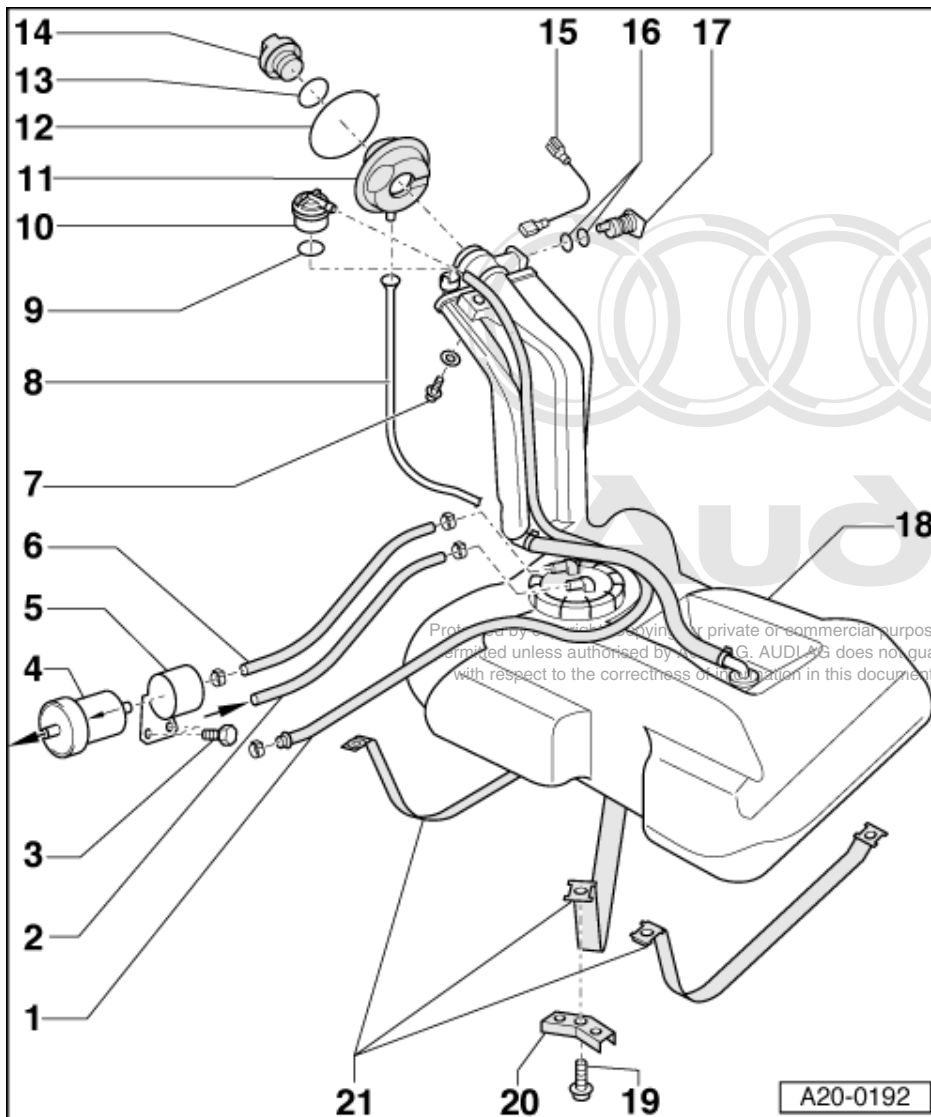
- ◆ To activated charcoal filter
=> Page 218 , Item 2

2 Return pipe

- ◆ From fuel manifold

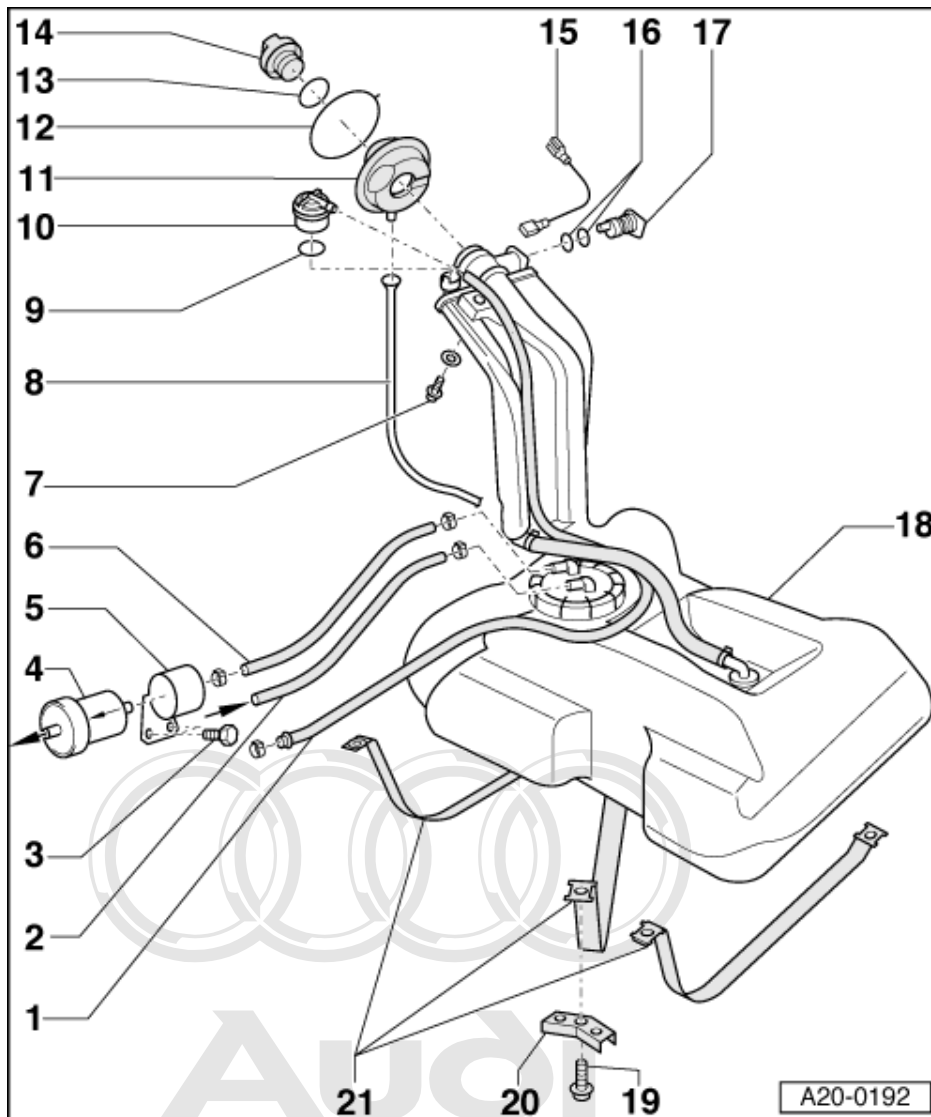


- ♦ Note direction of arrow on flange
- 3 20 Nm
- 4 Fuel filter
 - ♦ Installation position: Arrow points in through-flow direction



- 5 Retaining clip
 - ♦ For fuel filter
- 6 Supply pipe
 - ♦ To fuel manifold
 - ♦ Note direction of arrow on flange
- 7 25 Nm
- 8 Overflow hose
- 9 O ring
 - ♦ Renew
- 10 Gravity valve
 - ♦ Position => Fig. 1
 - ♦ To remove valve unclip upwards out of filler neck
 - ♦ Check valve for through-flow
valve vertical: open,

valve tilted 45 °: closed



11 Rubber cup

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12 Retaining ring

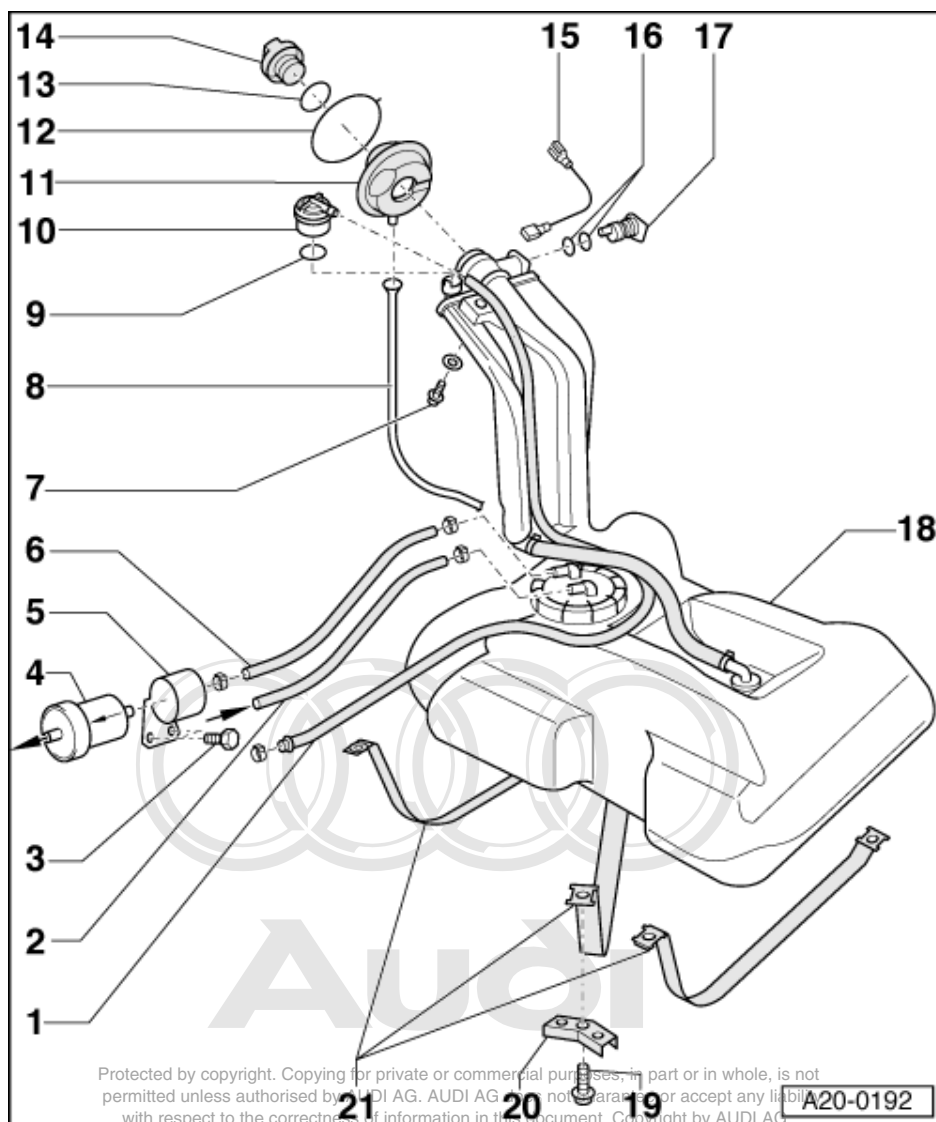
13 Seal

- ◆ Renew if damaged

14 Cap

15 Earth connection

- ◆ Position => Fig. 1
- ◆ Ensure that connector is seated properly on metal ring of filler neck
- ◆ Secure the contact tab of wire with bolt for fuel filler neck -Item 176
- ◆ After installation, use an ohmmeter to check the electrical connection between the metal ring on the fuel filler neck and a bare metal part on the body
Specification: approx. 0 Ω.



16 O rings

- ♦ Renew

17 Vent valve

- ♦ Position => Fig. 1
- ♦ Checking => Fig. 2

18 Fuel tank

- ♦ Removing and installing
=>Page 180

19 25 Nm

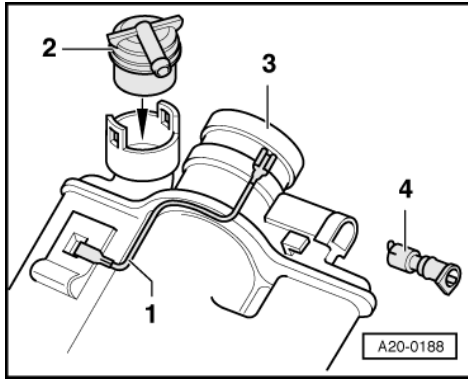
- ♦ Note tightening sequence
=> Page 181

20 Bracket

- ♦ For securing straps

21 Securing straps

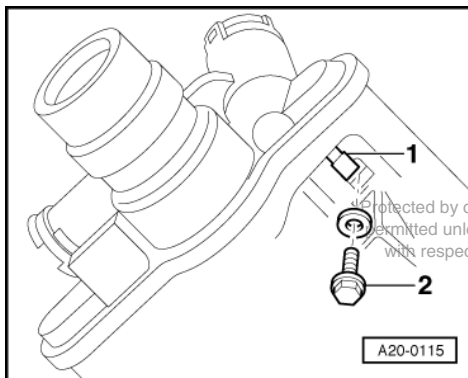
- ♦ Removing and installing
=>Page 180
- ♦ Note different lengths
- ♦ Note correct position



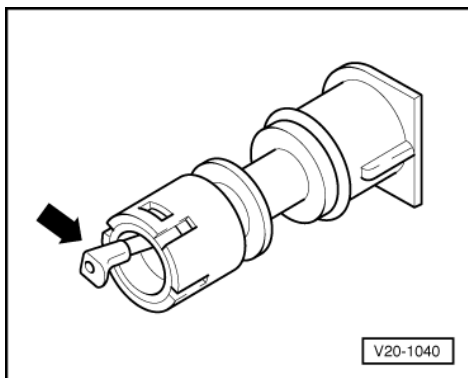
-> Fig.1 Position of gravity valve, vent valve and earth connection

- 1 - Earth connection
- 2 - Gravity valve
- 3 - Filler neck
- 4 - Vent valve

- Route earth connection as shown in illustration.
- Ensure that plug connector for earth connection is properly seated on metal ring on fuel filler neck.



- -> Secure the contact tab -1- of wire with bolt -2- for fuel filler neck.
- After installation, use an ohmmeter to check the electrical connection between the metal ring on the fuel filler neck and a bare metal part on the body.
 - Specification: approx. 0 Ω



-> Fig. 2 Checking vent valve

- Lever in released position: valve closed
- Lever pressed in direction of arrow: valve open



1.5 - Removing

Vehicles with front-wheel drive:

Observe notes => Page 174 .

Observe safety precautions=> Page 174

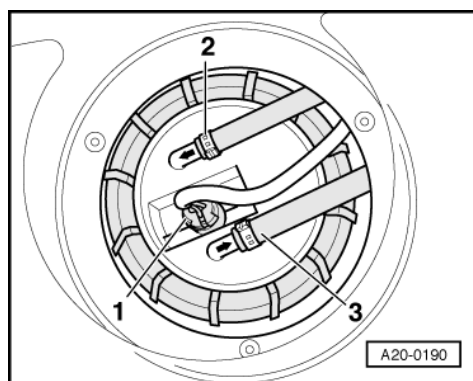
Observe rules for cleanliness => Page 175

Special tools, testers and auxiliary items

- ♦ Universal support V.A.G 1359/2
- ♦ Engine/gearbox jack V.A.G 1383 A
- ♦ Fuel extractor V.A.G 1433 A

Notes:

- ♦ To reduce weight, the fuel tank should be empty when removing.
- ♦ If necessary, drain tank using fuel extractor V.A.G 1433 A.
- Obtain radio code on vehicles with coded radio.
- With ignition switched off disconnect battery earth strap.
- Detach trim in luggage compartment.
- Detach cover for flange on fuel tank under floor trim in luggage compartment.

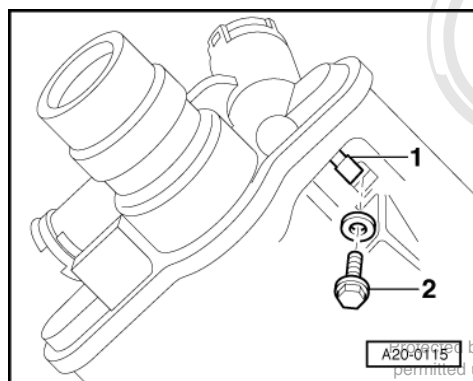


- -> Release and unplug 4-pin connector -1-.

Note:

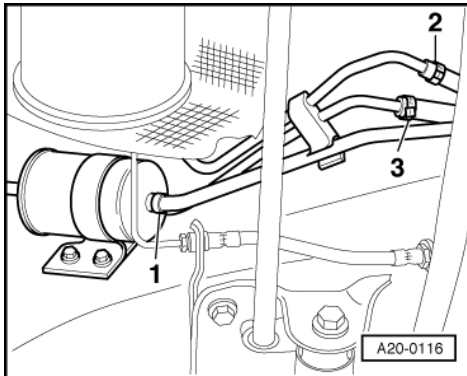
Do not disconnect return pipe -2- and supply pipe -3-.

- Clean area around tank filler neck.
- Open tank flap and lever out clamping ring in rubber cup (on filler neck).
- Press rubber cup through to the inside.
- Take off rear right wheel.
- Remove rear right wheel housing liner.

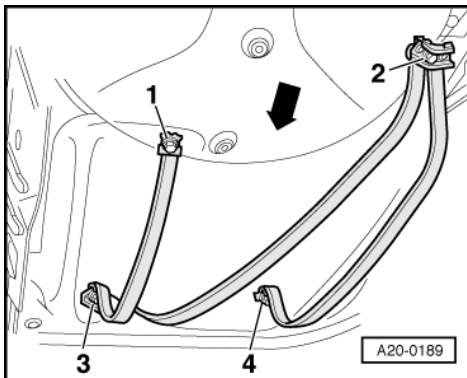


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- -> Remove bolt -2- for fuel filler neck below wheel housing liner.



- -> On underside of vehicle, mark supply pipe -1-, return pipe -2- and breather pipe -3-, and pull off pipes.
- Position engine/gearbox hoist V.A.G 1383 A below vehicle to support tank.



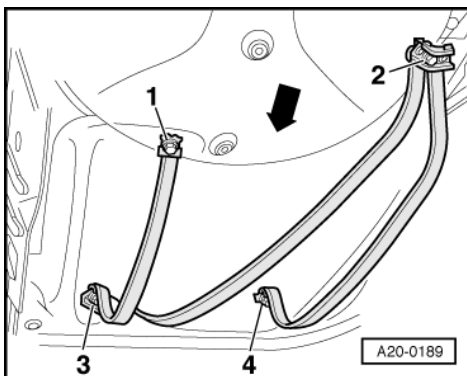
- Mark the correct positions of the securing straps.
- -> Remove the securing straps -1 ... 4-.
- Lower fuel tank out of vehicle.

Note:

Arrow points in direction of travel.

1.6 - Installing

Installation is carried out in the reverse order, when doing this note the following:

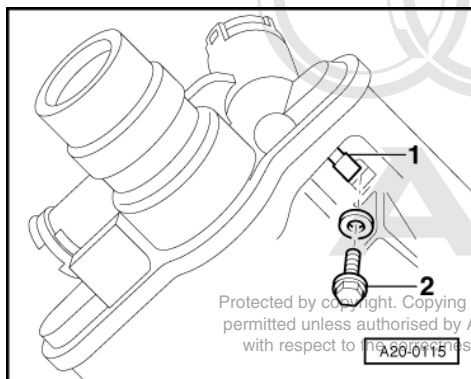


- Position fuel tank and securing straps on underside of vehicle using engine/gearbox jack V.A.G 1383 A.
- Push the fuel tank all the way to the right.

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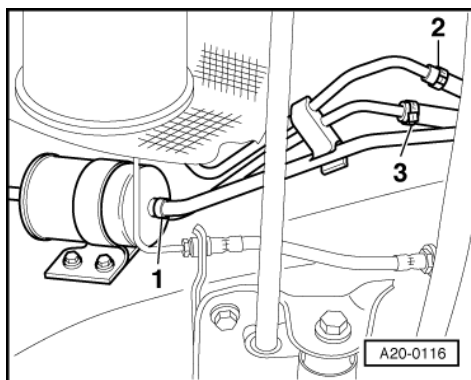


- -> First tighten bolts -1- and -2-, then bolts -3- and -4- (25 Nm).



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- -> Tighten bolt -2- on filler neck last (25 Nm).
- Ensure that earth terminal -1- is also secured by bolt.
- After completing installation, use an ohmmeter to check the electrical connection between the metal ring on the fuel filler neck and a bare metal part on the body.
 - Specification: approx. 0 Ω



- -> Connect pipes as previously marked:
 - 1 - Supply pipe
 - 2 - Return pipe
 - 3 - Breather pipe to activated charcoal filter
- Plug in connector for fuel pump and fuel gauge sender.
- After connecting battery, enter anti-theft code for radio

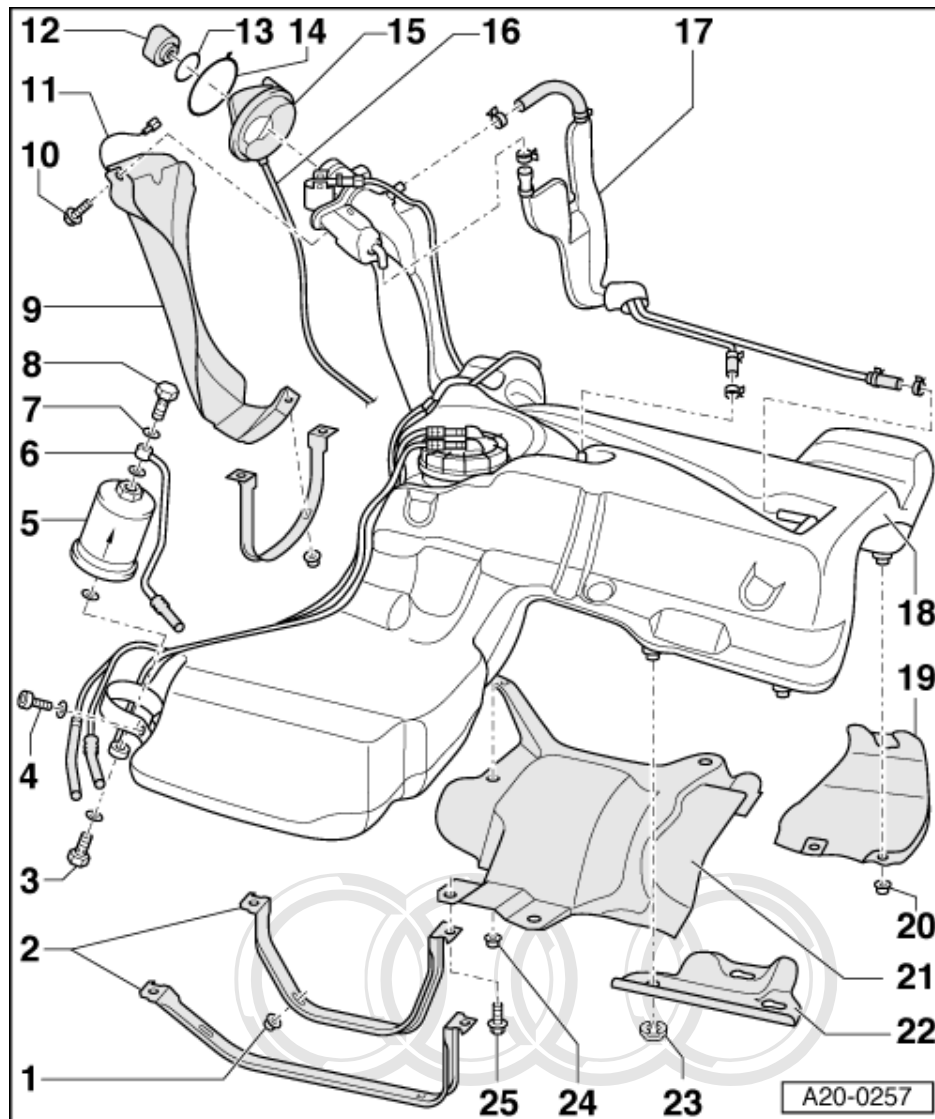
=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch function.
- Set clock to correct time.

Tightening torque

Component	Nm
Securing straps for fuel tank to body	25

1.7 - Removing and installing fuel tank with its attachments (vehicles with four-wheel drive)



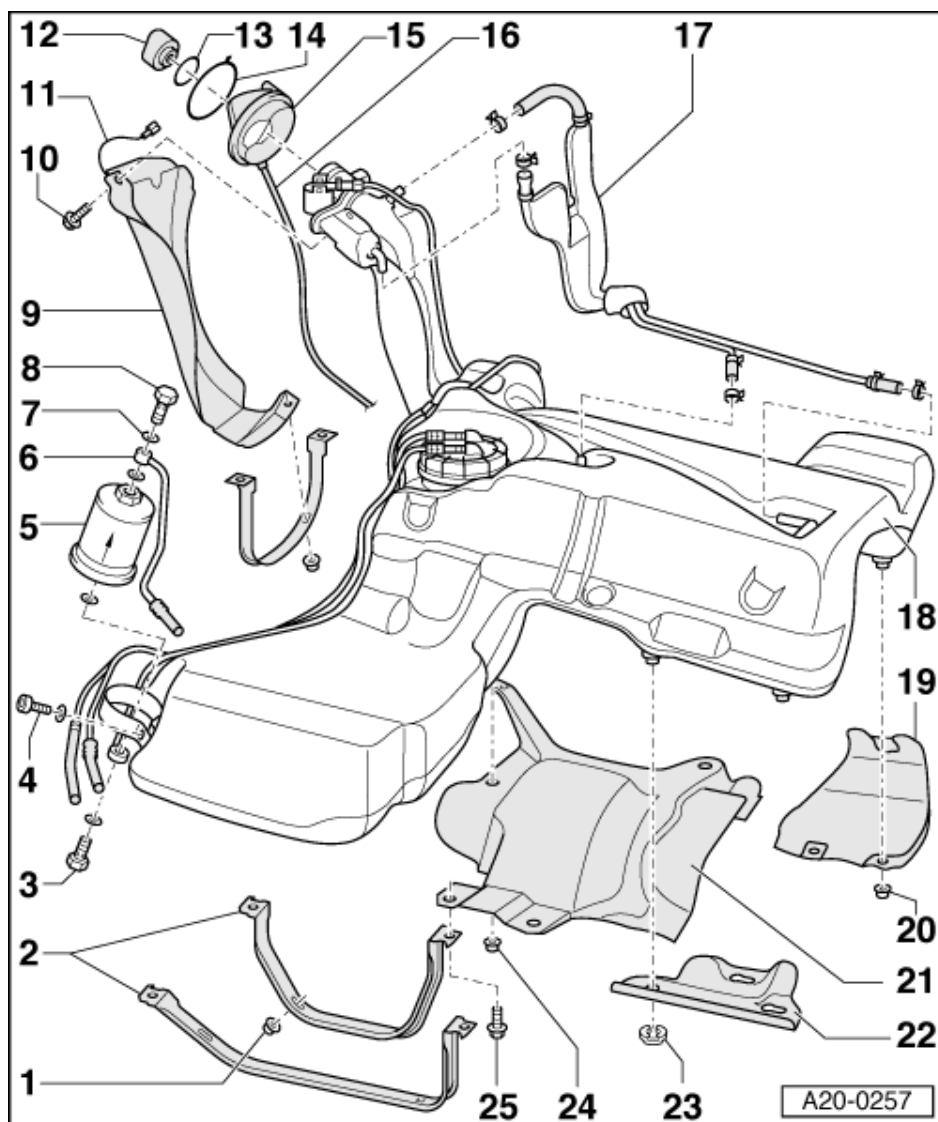
1 Plastic nut - 2 Nm

- ♦ Tighten loosely to hold securing straps in place on fuel tank
- ♦ Do not tighten fully until securing strap mountings have been secured

2 Securing straps

- ♦ Removing and installing
=>Page 188
- ♦ Note different lengths
- ♦ Note correct position

3 Banjo bolt M14 - 30 Nm



4 1.2 Nm

5 Fuel filter

- ♦ Installation position: Arrow points in through-flow direction

6 Supply pipe

- ♦ To fuel supply pipe on fuel manifold

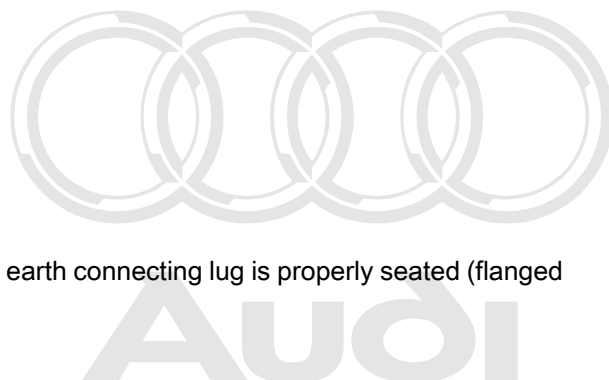
7 Seal

- ♦ Renew

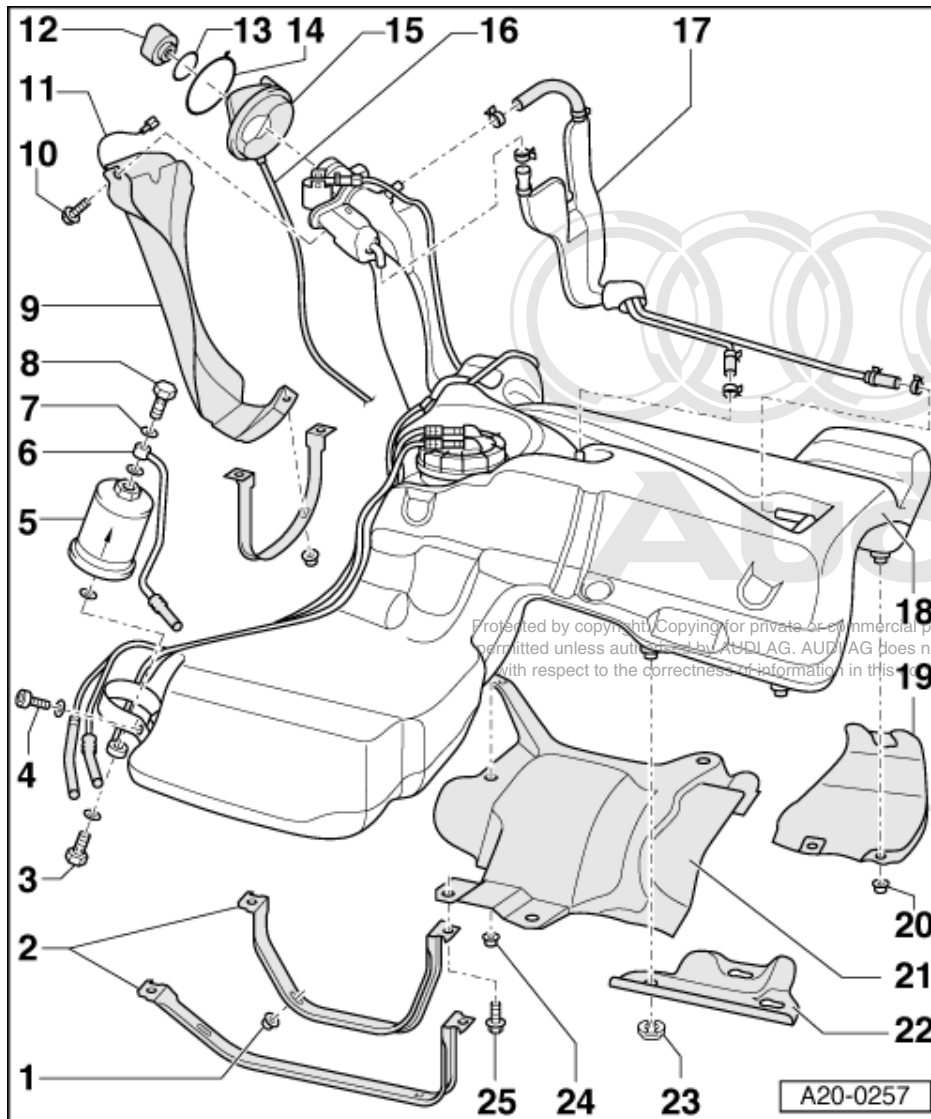
8 Banjo bolt M12 - 20 Nm

9 Protective plate

- ♦ For fuel filler neck
- ♦ With earth connection
- ♦ Before screwing in securing bolt -Item 10-, ensure that earth connecting lug is properly seated (flanged edge)



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10 25 Nm

11 Earth connection

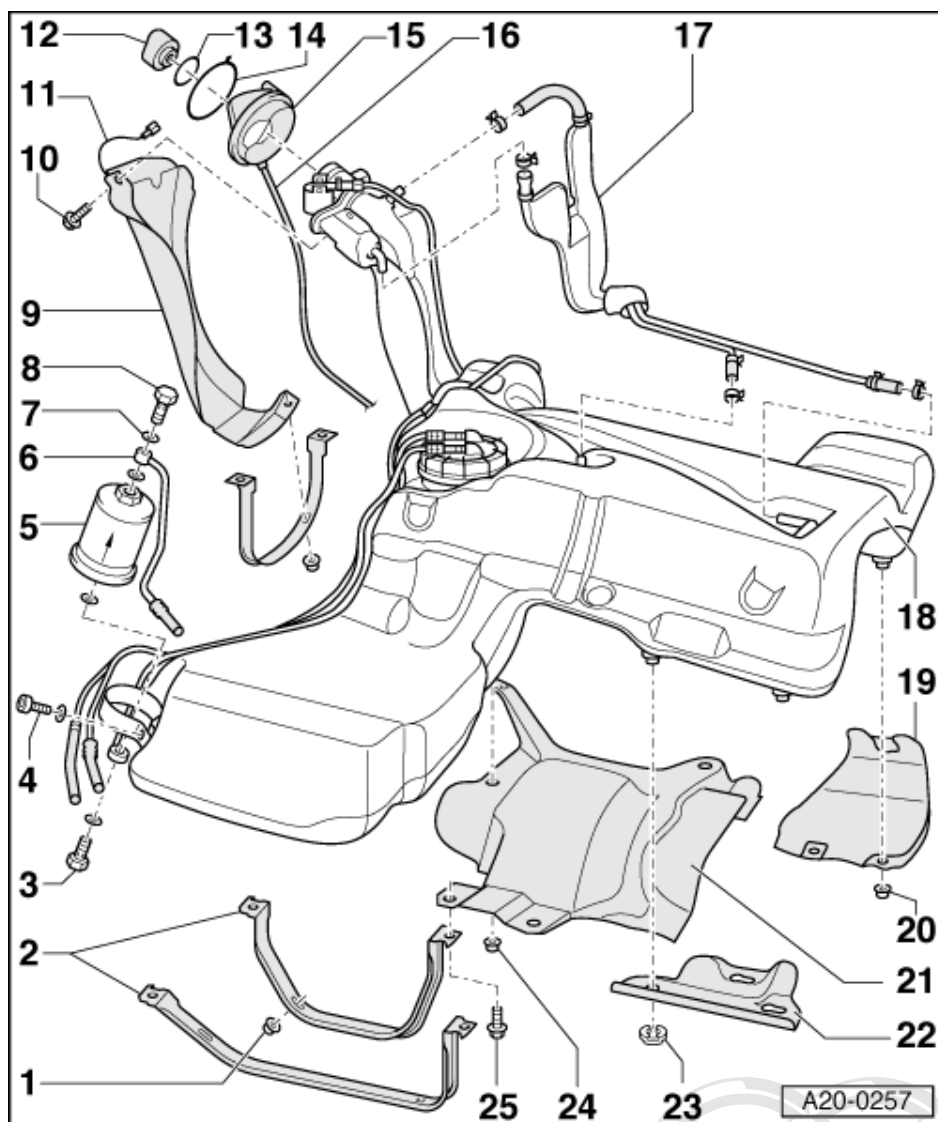
- ◆ Position => Fig. 1
- ◆ Ensure connector is seated properly on metal ring of fuel filler neck (check flanged edge on protective plate -Item 9 -)
- ◆ After installation, use an ohmmeter to check the electrical connection between the metal ring on the fuel filler neck and a bare metal part on the body
Specification: approx. 0 Ω .

12 Filler cap

13 Seal

- ◆ Renew if damaged

14 Retaining ring



15 Rubber cup

16 Overflow hose

17 Expansion tank

- ◆ Secure pipes to expansion chamber with adhesive tape

18 Fuel tank

- ◆ Removing and installing
=>Page 188

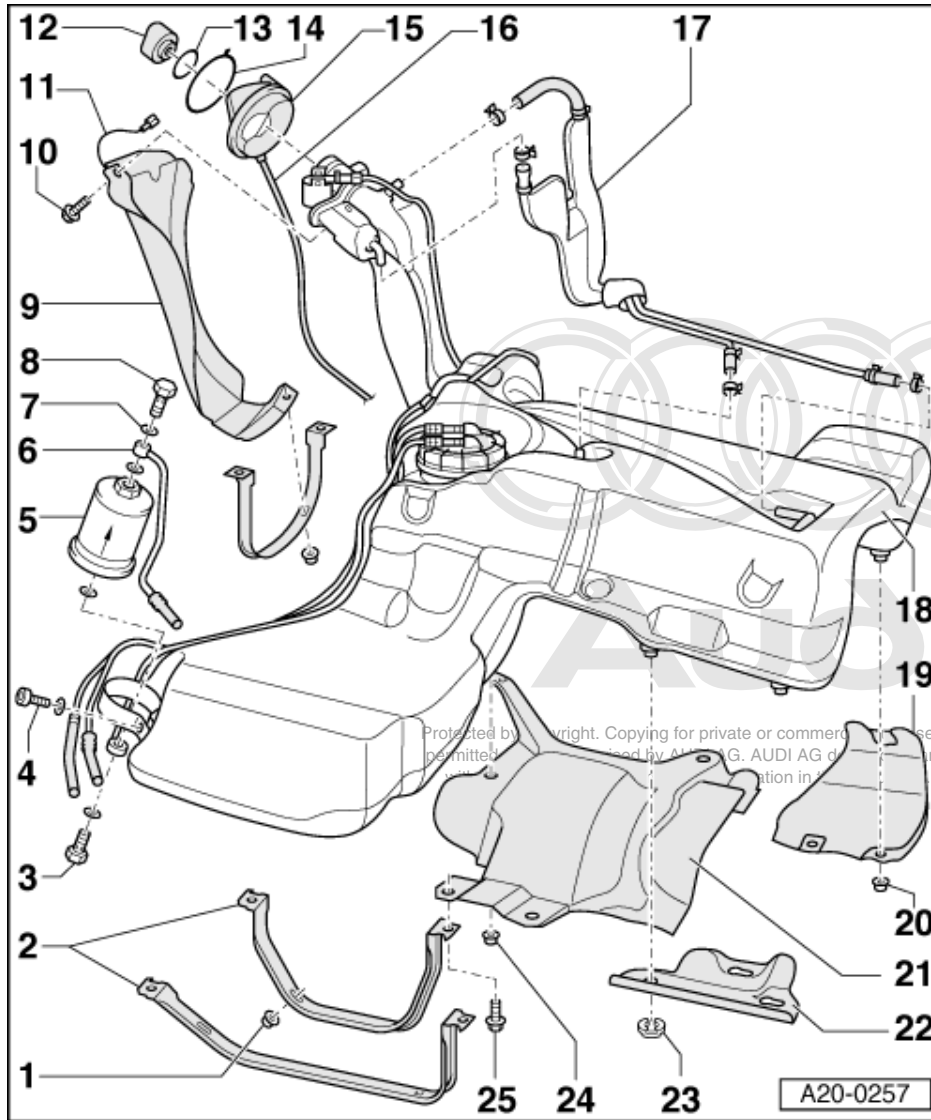
19 Heat shield

- ◆ For fuel tank
- ◆ Rear edge secured to fuel tank with adhesive tape

20 Plastic nut - 2 Nm

21 Carrier plate

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22 Heat shield

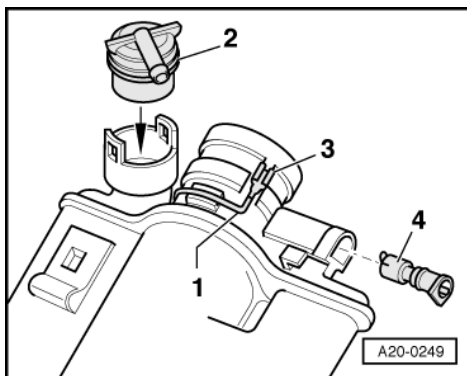
- ♦ For fuel filler neck

23 Securing clip

- ♦ Check securely seated

24 Plastic nut - 2 Nm

25 25 Nm

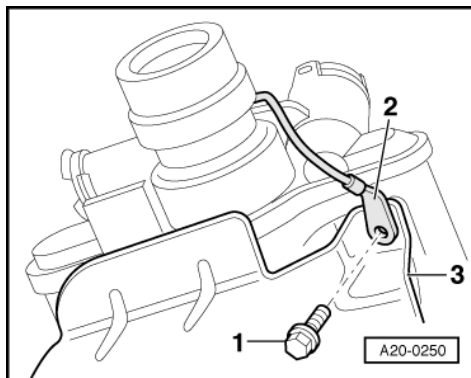




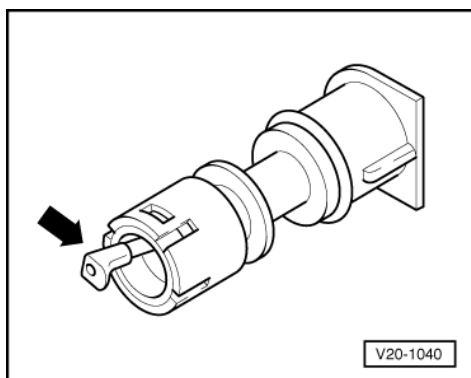
-> Fig.1 Position of gravity valve, vent valve and earth connection

- 1 - Earth connection
- 2 - Gravity valve
- 3 - Filler neck
- 4 - Vent valve

- Position the earth connection as illustrated.
- Ensure that connector for earth connection is properly seated on metal ring of fuel filler neck.



- -> Before screwing in securing bolt -1-, ensure earth connecting lug -2- is properly seated (flanged edge) on protective plate -3- for fuel filler neck.
- After installation, use an ohmmeter to check the electrical connection between the metal ring of the fuel filler neck and a bare metal part on the body.
 - Specification: approx. 0 Ω



-> Fig. 2 Checking vent valve

- Lever in released position: valve closed
- Lever pressed in direction of arrow: valve open

1.8 - Removing

Vehicles with four-wheel drive:

Observe notes => Page 174 .

Observe safety precautions
=> Page 174

Observe rules for cleanliness
=> Page 175

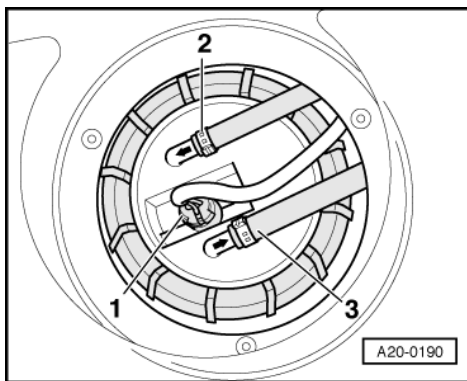
Special tools, testers and auxiliary items

- ◆ Universal support V.A.G 1359/2
- ◆ Engine/gearbox jack V.A.G 1383 A
- ◆ Fuel extractor V.A.G 1433 A

Notes:

- ◆ To reduce weight, the fuel tank should be empty when removing.
- ◆ If necessary, drain tank using fuel extractor V.A.G 1433 A.
- Obtain radio code on vehicles with coded radio.
- With ignition switched off, disconnect battery earth strap.
- Remove rear axle:

=> Running gear, front-wheel drive and four-wheel drive; Repair group 42; Removing and installing rear axle



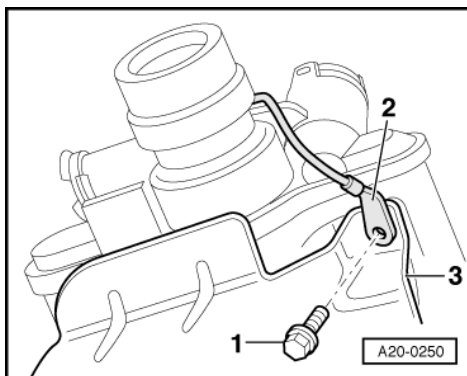
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- Detach trim in luggage compartment.
- Detach cover for flange on fuel tank under floor trim in luggage compartment.
- -> Release and unplug 4-pin connector -1-.

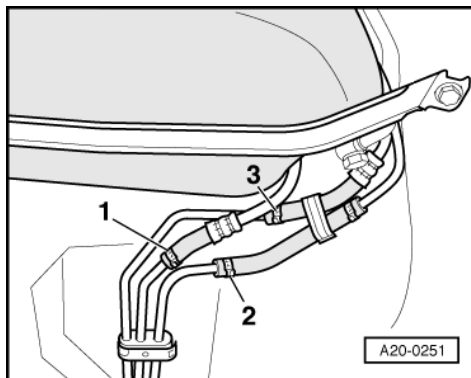
Note:

Do not disconnect return pipe -2- and supply pipe -3-.

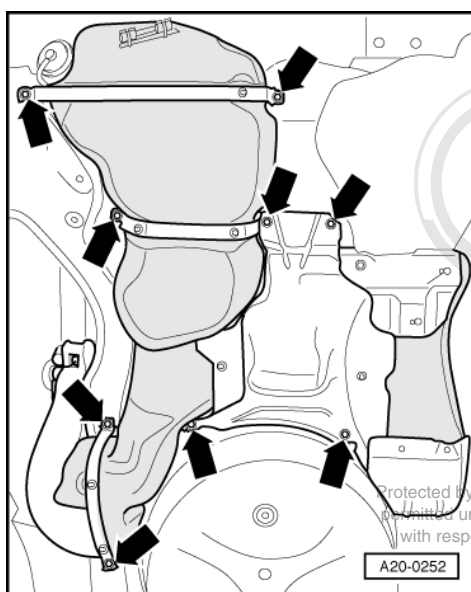
- Clean area around tank filler neck.
- Open tank flap and lever out clamping ring in rubber cup (on filler neck).



- Press rubber cup through to the inside.
- Take off rear right wheel.
- Remove rear right wheel housing liner.
- -> Remove bolt -1- for fuel filler neck, earth connection -2- and protective plate -3- below wheel housing liner.



- -> On underside of vehicle, mark supply pipe -1-, return pipe -3- and breather pipe -2- and disconnect pipes.
- Position engine/gearbox hoist V.A.G 1383 A below vehicle to support tank.

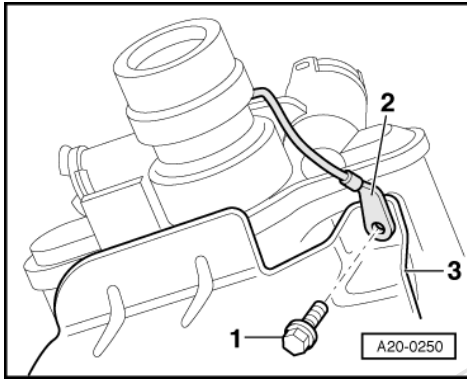


- Mark the correct positions of securing straps.
- -> Remove securing straps and carrier plate -arrows-.
- Lower fuel tank out of vehicle.

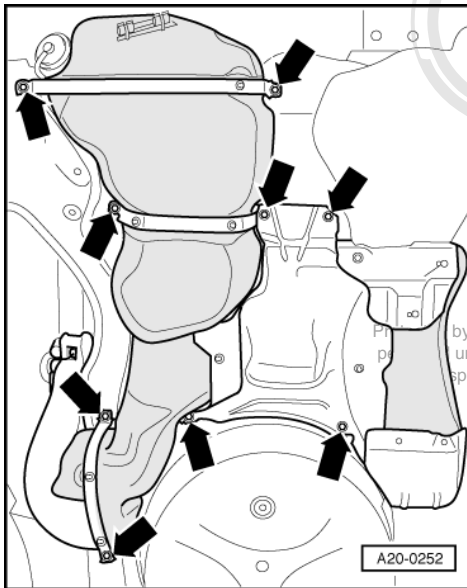
1.9 - Installing

Installation is carried out in the reverse order, when doing this note the following:

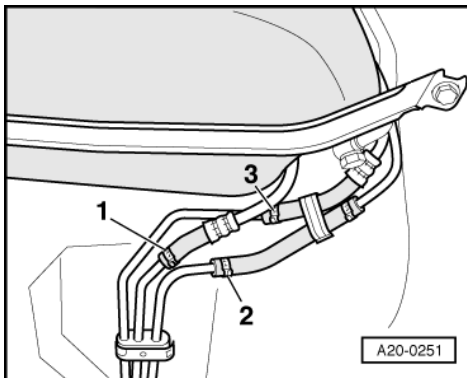
- Loosely attach securing straps and carrier plate on fuel tank.
- Position fuel tank with securing straps and carrier plate on underside of vehicle using engine/gearbox jack V.A.G 1383 A.
- Ensure that earth connection plug is properly seated on metal ring on fuel filler neck.



- -> First tighten bolt -1- securing protective plate -3-, earth connection -2- and fuel filler neck.



- -> Tighten bolts for securing straps and carrier plate -arrows-.
- Tighten plastic nuts on securing straps and carrier plate.



- -> Connect pipes as previously marked:

- 1 - Supply pipe
- 3 - Breather pipe to activated charcoal filter
- 2 - Return pipe

- Plug in connector for fuel pump and fuel gauge sender.
- After installation, use an ohmmeter to check the electrical connection between the metal ring on the fuel filler neck and a bare metal part on the body
 - Specification: approx. 0 ω

- ## Tightening torques

straps to fuel tank	2	in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability
late to fuel tank	2	Copyright by AUDI AG.

This exploded view diagram illustrates the assembly of the A20-0253 car stereo unit. The components are numbered as follows:

- 1**: Main stereo housing
- 2**: Mounting bracket
- 3**: Mounting screws
- 4**: Mounting pins
- 5**: Mounting plate
- 6**: Mounting bracket
- 7**: Mounting ring
- 8**: Mounting ring
- 9**: Antenna cable
- 10**: Antenna cable
- 11**: Antenna cable
- 12**: Antenna cable
- 13**: Antenna cable
- 14**: Antenna cable
- 15**: Antenna cable
- 16**: Antenna cable
- 17**: Antenna cable

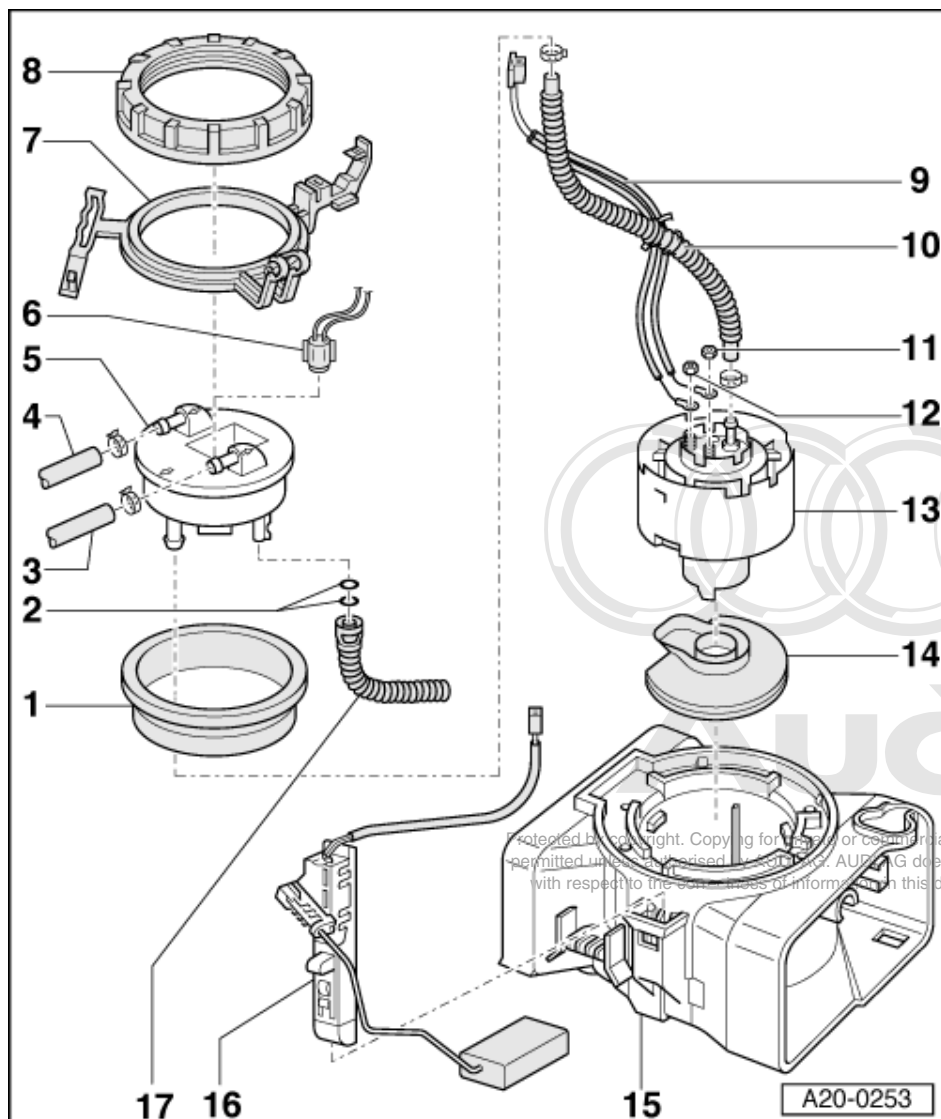
- 192 20 - Fuel supply system

-

-
- 1.10 - Removing and installing fuel delivery unit and fuel gauge sender (vehicles with front-wheel drive) **193**



- ◆ Hold in position when tightening union nut



8 Union nut, 60 Nm

- ◆ Remove and install with spanner 3217

9 Electrical wires

- ◆ To fuel pump
- ◆ Secure to -Item 10 - with fuel-resistant cable ties

10 Supply pipe

- ◆ Fuel pump/baffle housing
- ◆ Position => Page 199

11 Nut M4 - 1.5 Nm

- ◆ Fit toothed washer under nut

12 Nut M5 - 2 Nm

- ◆ Fit toothed washer under nut



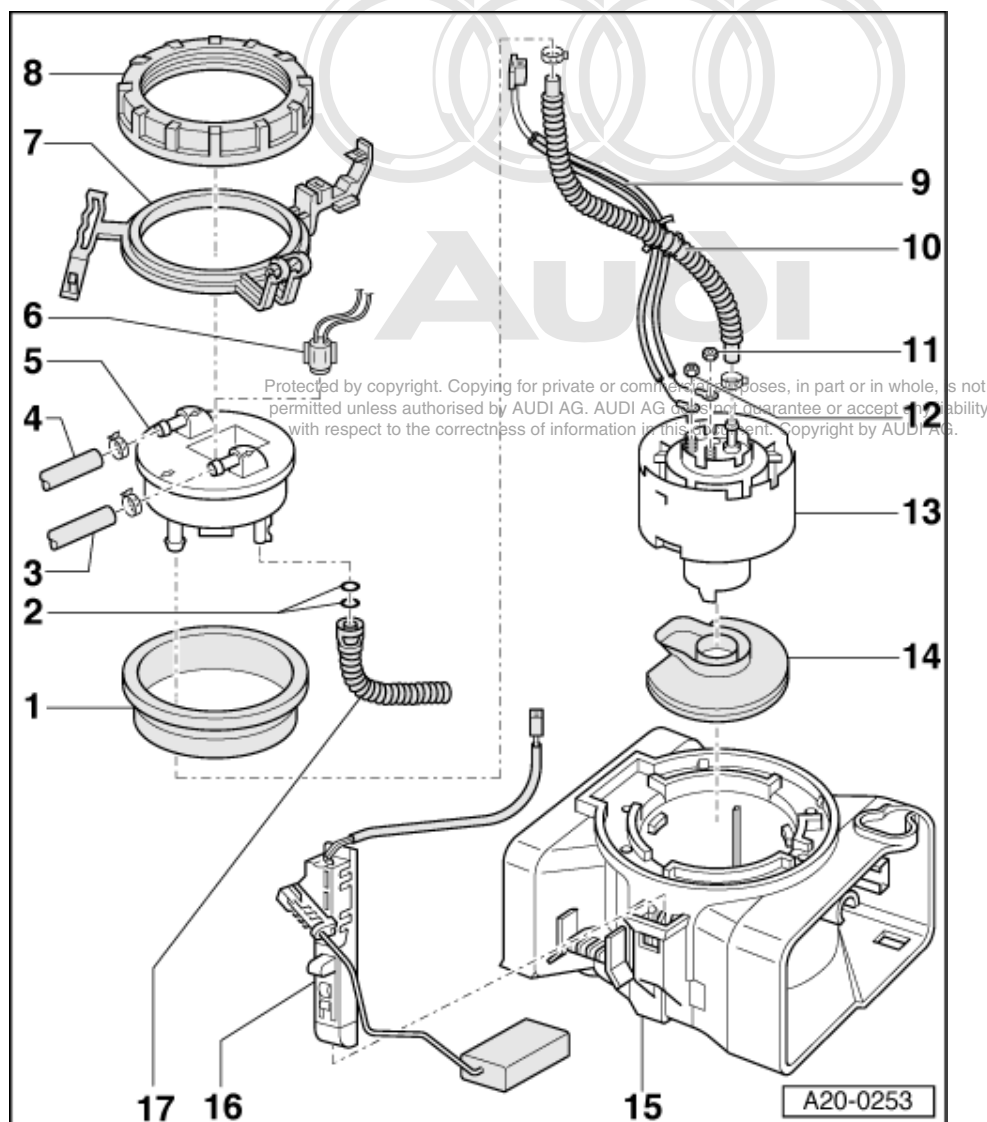
13 Fuel delivery unit

- ◆ Removing and installing
=> Page 197
- ◆ Checking fuel pump
=> Page 214
- ◆ Checking holding pressure:

- => Motronic injection and ignition system (4-cylinder); Repair group 24; Servicing Motronic injection system; Testing fuel pressure, fuel pressure regulator and holding pressure Servicing Motronic injection system Testing fuel pressure, fuel pressure regulator and holding pressure

14 Baffle housing (lower section)

- 1.10 - Removing and installing fuel delivery unit and fuel gauge sender (vehicles with front-wheel drive) **195**



15 Baffle housing (lower section)

- ♦ Secured in place in fuel tank
- ♦ Cannot be dismantled

16 Fuel gauge sender -G

- ♦ Block-shaped float
- ♦ Removing and installing
=> Page 207

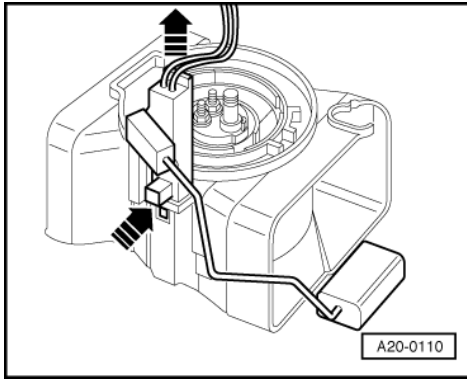
17 Return pipe

- ♦ Connected to inside of flange
- ♦ Press release tabs on connection to pull off

1.11 - Removing and installing fuel gauge sender (vehicles with front-wheel drive)

Removing

- Remove flange from fuel tank => Removing fuel delivery unit, Page 197 .
- Pull out flange carefully and place to one side with wiring and hoses connected.
- Unplug connector for fuel gauge sender on inside of flange.



- -> Press retaining tab, and at the same time pull the sender unit out of baffle housing in fuel tank -arrows-.

Note:

The baffle housing is shown without the fuel tank for a clearer illustration.

Installing

- Insert fuel gauge sender into guide on outer section of baffle housing and press down until it clicks into place.
- Wrap wire for fuel gauge sender once round return pipe (in tank).
- Install flange => Page 202 .
- After connecting battery, enter anti-theft code for radio

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch function.
- Set clock to correct time.

1.12 - Removing and installing fuel delivery unit (vehicles with front-wheel drive)

Observe notes => Page 174 .

Observe safety precautions=> Page 174

Observe rules for cleanliness => Page 175

Special tools, testers and auxiliary items

- ◆ Ring nut spanner 3217
- ◆ Fuel pump spanner 3307
- ◆ Hose clamp pliers V.A.G 1275
- ◆ Fuel extractor V.A.G 1433 A

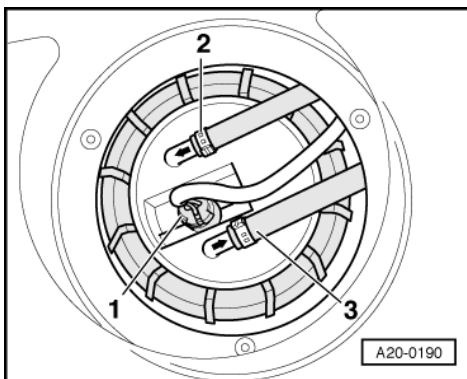
Removing

Notes:

- ◆ The fuel tank must not be more than 1/3 full.
- ◆ If necessary, drain tank using fuel extractor V.A.G 1433 A.

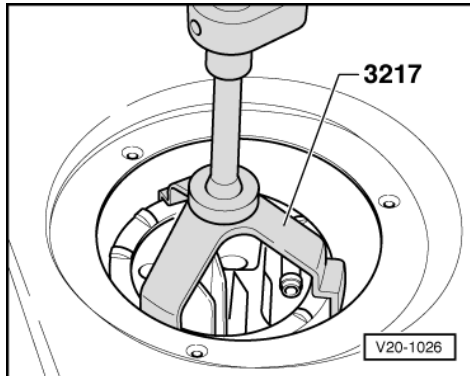
Obtain radio code on vehicles with coded radio.

- With ignition switched off disconnect battery earth strap.





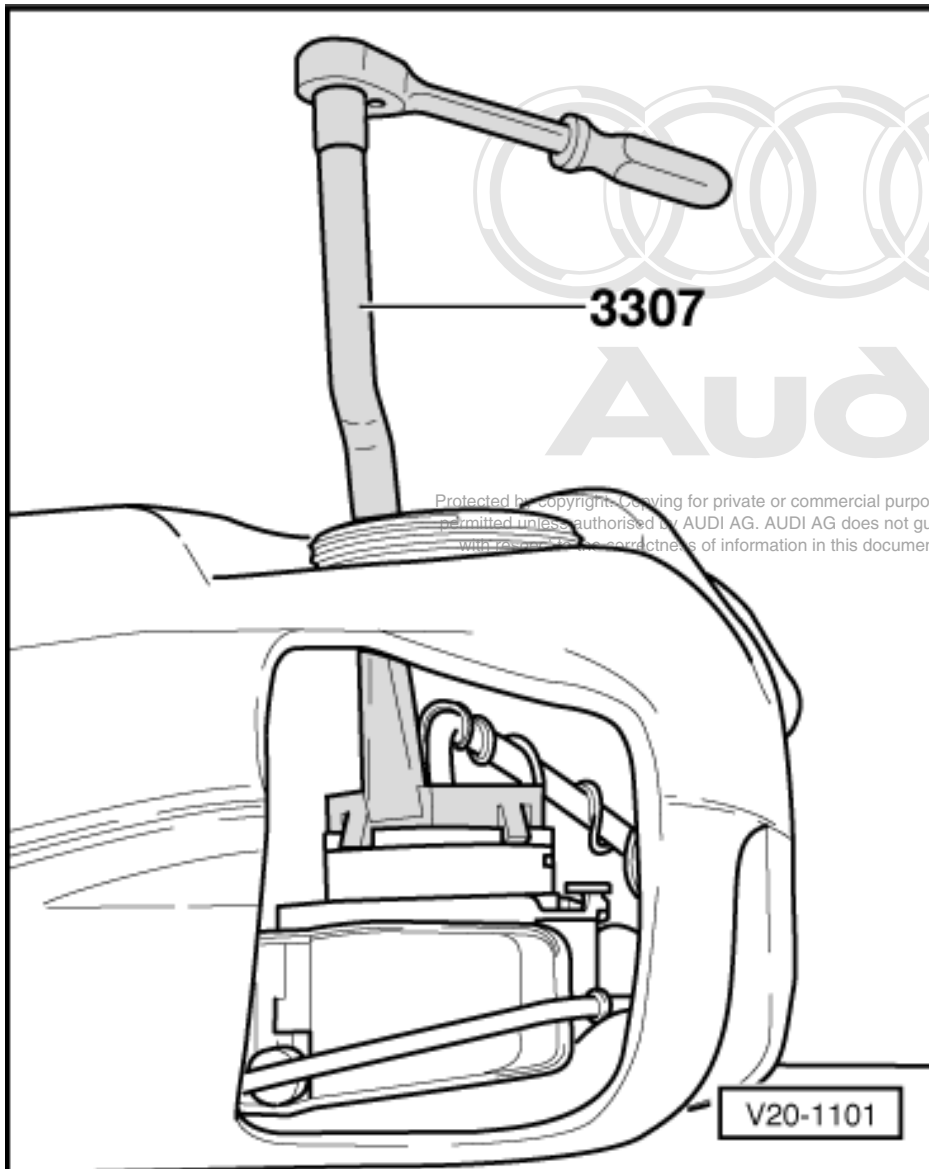
- Remove luggage compartment trim.
- Unbolt cover for flange on fuel tank under floor trim in luggage compartment.
- -> Mark the supply pipe -2- and return pipe -3-, then pull pipes off flange.
- Release 4-pin connector -1- and unplug.



- -> Remove union nut with spanner 3217.
- Remove flange and seal out of opening in fuel tank.
- Unplug connector for fuel gauge sender on inside of flange.
- Pull fuel return pipe off inside of fuel delivery unit flange (press release tabs).



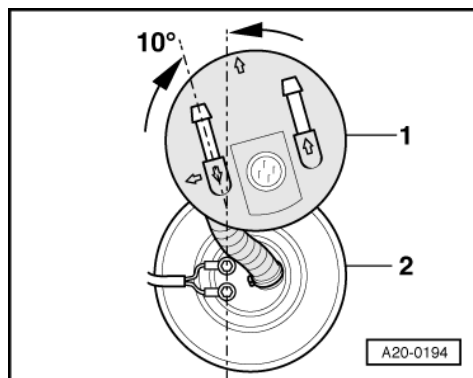
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- -> Insert fuel pump spanner 3307 through opening in fuel tank and apply spanner to inner section of baffle housing.
- Using spanner 3307 turn inner section of baffle housing anti-clockwise as far as it will go (approx. 15°), and take out fuel pump with inner section of baffle housing.

Pre-assembling flange and inner section of baffle housing

- If flange and delivery unit have been separated, pre-assemble components before installing => Page 192.

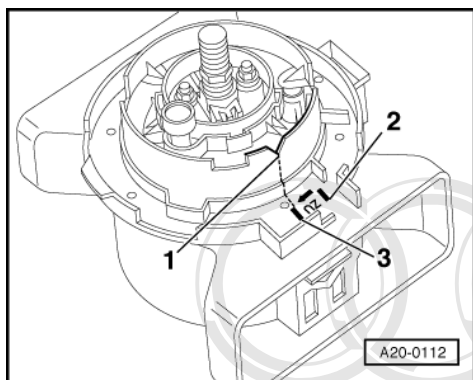


- -> Angle between flange and inner section of baffle housing: 10°
- Compress clamps for supply pipe (between pump and flange) using hose clamp pliers V.A.G 1275.
- Connect electrical wires onto fuel pump
(M4: 1.5 Nm; M5: 2 Nm)

Note:

Fit a toothed washer under each nut.

- Secure the electrical wires using a fuel-resistant cable tie.

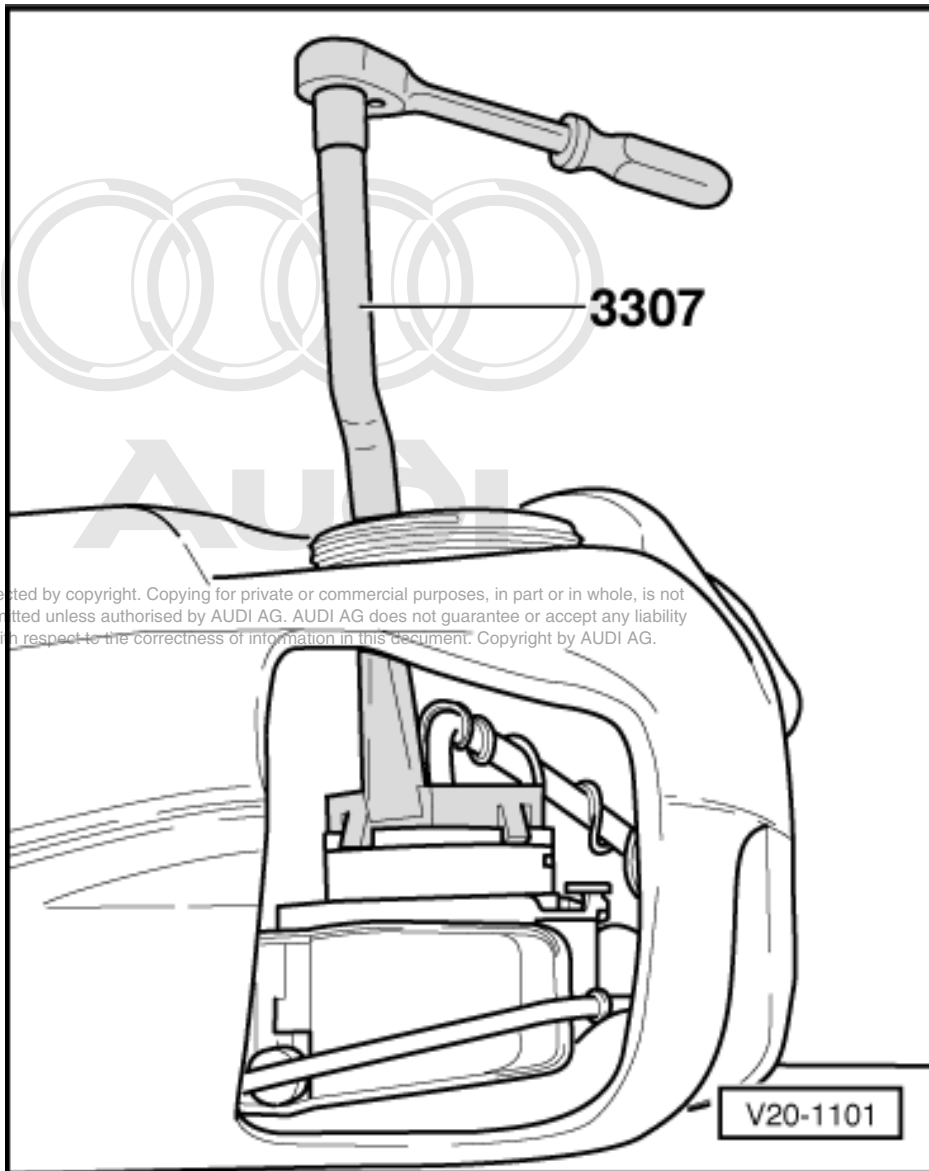


Installing

- Insert inner section of baffle housing, supply hose and flange in fuel tank.
- -> Fit inner section of baffle housing into outer section of baffle housing (in tank) so that notch -1- on inner section of housing is aligned with marking -2- on outer section of housing.
- Inner section of baffle housing should move down noticeably.

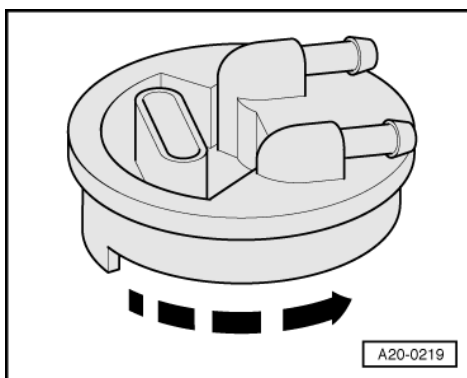
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Note:



Baffle housing is shown without fuel tank for a clearer illustration.

- -> Apply fuel pump spanner 3307 and turn pump together with inner section of baffle housing clockwise as far as it will go (approx. 15°). Notch -1- will then be aligned with marking -3- (bayonet fitting)=>FigA20-0112.





- -> When installing, turn flange in an anti-clockwise direction, as indicated in illustration.
- Connect return pipe on inside of flange.

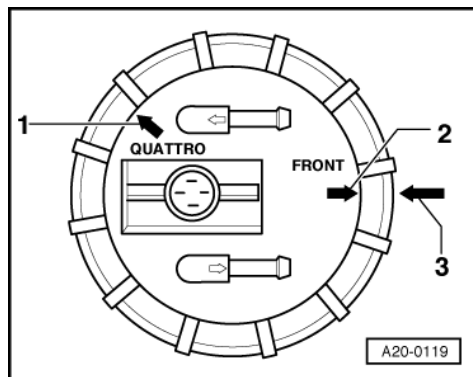
Note:

Lubricate O-rings with fuel or other lubricant.

- Wrap wire for fuel gauge sender once round return pipe (in tank) and connect to flange.

Note:

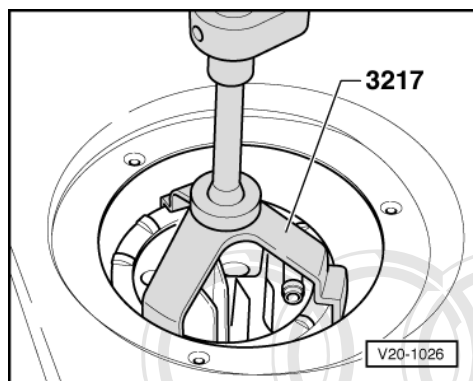
Lubricate the flange seal with fuel before fitting.



- -> Insert flange in tank; note correct installation position:
 - Marking on sealing flange must coincide with marking on fuel tank -arrows-.
 - Installation position for vehicles with front-wheel drive:
 - arrow 2- must be aligned with -arrow 3-.

Note:

-Arrow 1- is for vehicles with four-wheel drive (can be ignored).



- -> Tighten union nut with spanner 3217.

Note:

The pipe retainer -Item 193 must be held in position when tightening the union nut.

- Connect pipes and plug in the connector.

Note:

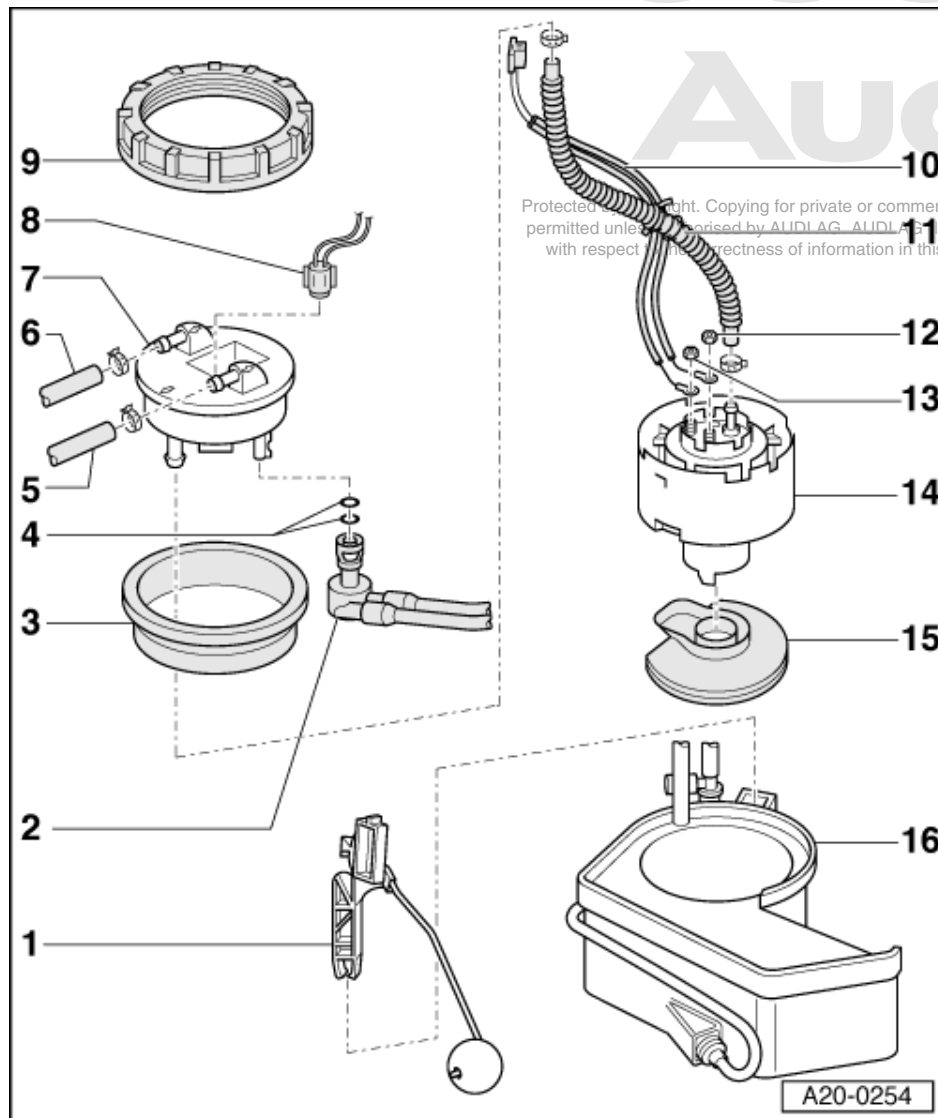
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Ensure that fuel pipes are fitted securely.

Tightening torque

Component	Nm
Union nut for flange	60

1.13 - Removing and installing fuel delivery unit and fuel gauge sender (vehicles with four-wheel drive)

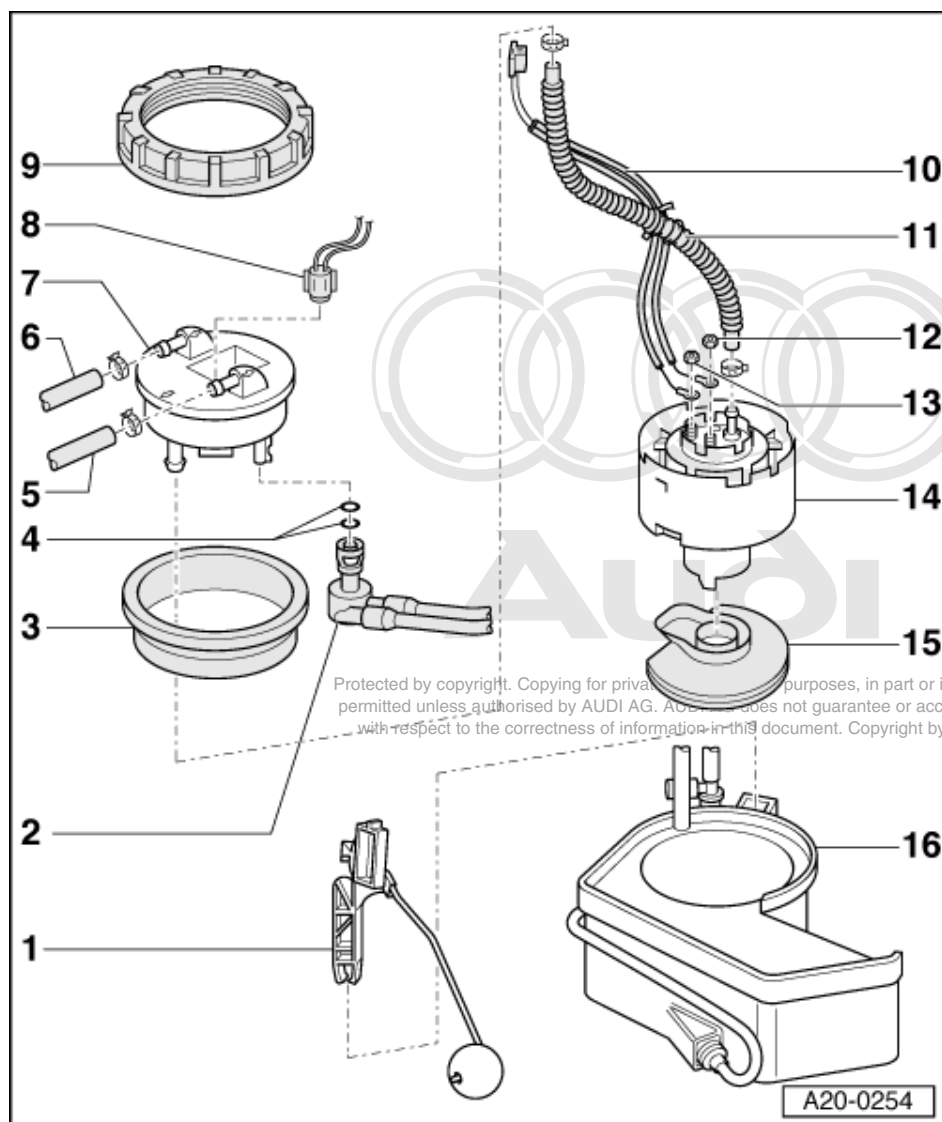


1 Fuel gauge sender -G

- ♦ Ball float
- ♦ Removing and installing
=>Page 207

2 Return pipe

- ♦ With suction jet pump
- ♦ Connected to inside of flange
- ♦ Press release tabs on connection to pull off



3 Seal

- ◆ Renew if damaged
- ◆ When installing, lubricate with fuel and insert in fuel tank opening

4 O rings

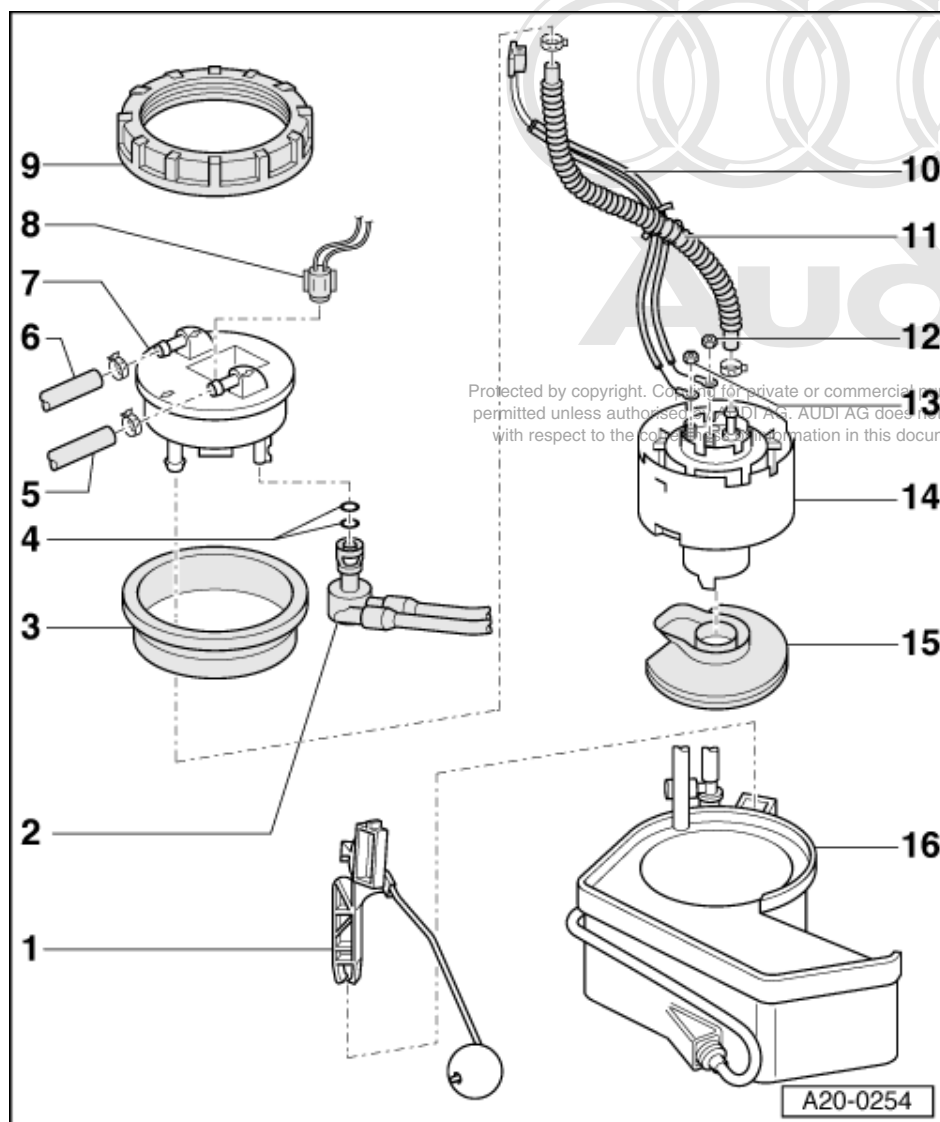
- ◆ Renew
- ◆ Ensure correctly fitted

5 Return pipe

- ◆ From fuel manifold
- ◆ Mark pipe before disconnecting
- ◆ Note direction of arrow on flange

6 Supply pipe

- ◆ To fuel manifold
- ◆ Mark pipe before disconnecting
- ◆ Note direction of arrow on flange



7 Flange

- ♦ Removing and installing
=> Page 197
- ♦ Installation position: see arrow
=> Page 200

8 Connector

- ♦ For fuel pump and fuel gauge sender -G

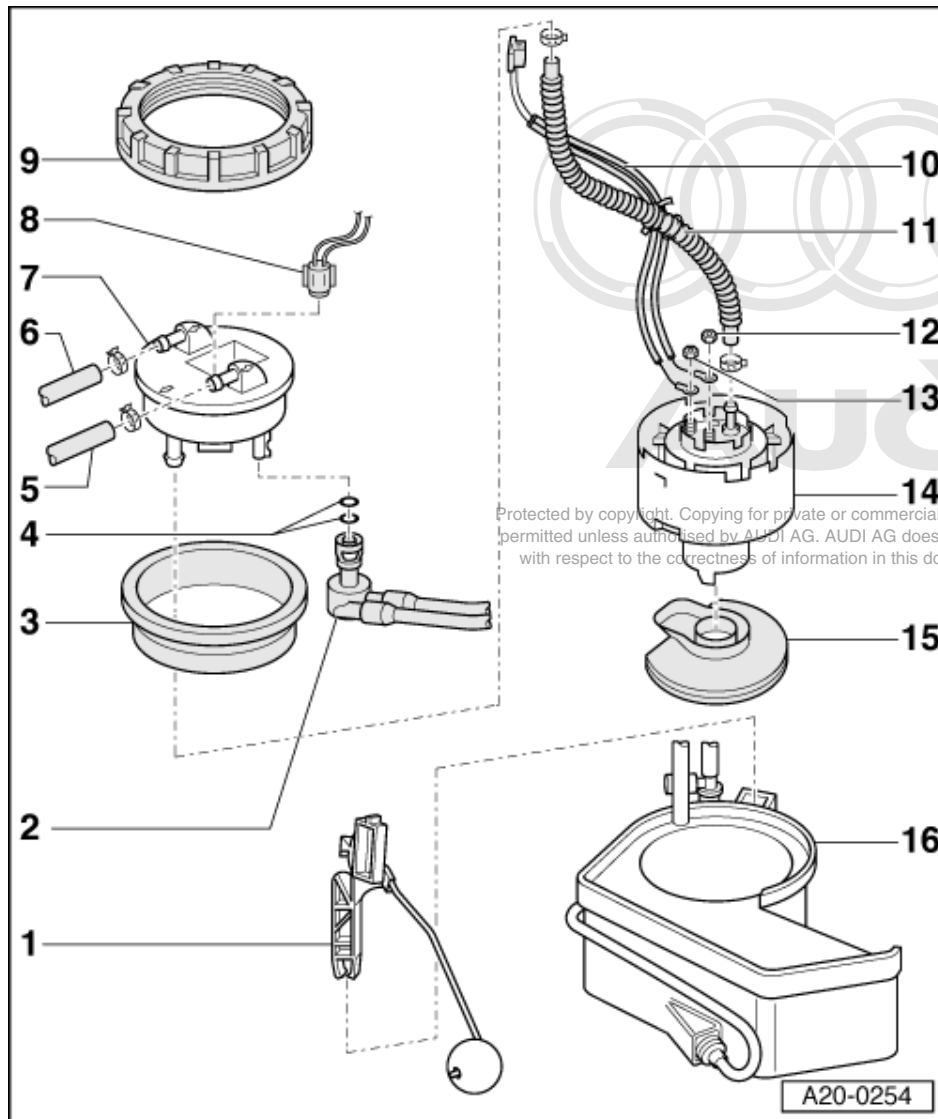
9 Union nut, 60 Nm

10 Electrical wires

- ♦ To fuel pump
- ♦ Secure to -Item 11 - using fuel-resistant cable tie

11 Supply pipe

- ♦ Fuel pump/baffle housing
- ♦ Position => Page 210

**12 Nut M4 - 1.5 Nm**

- ♦ Fit toothed washer under nut

13 Nut M5 - 2 Nm

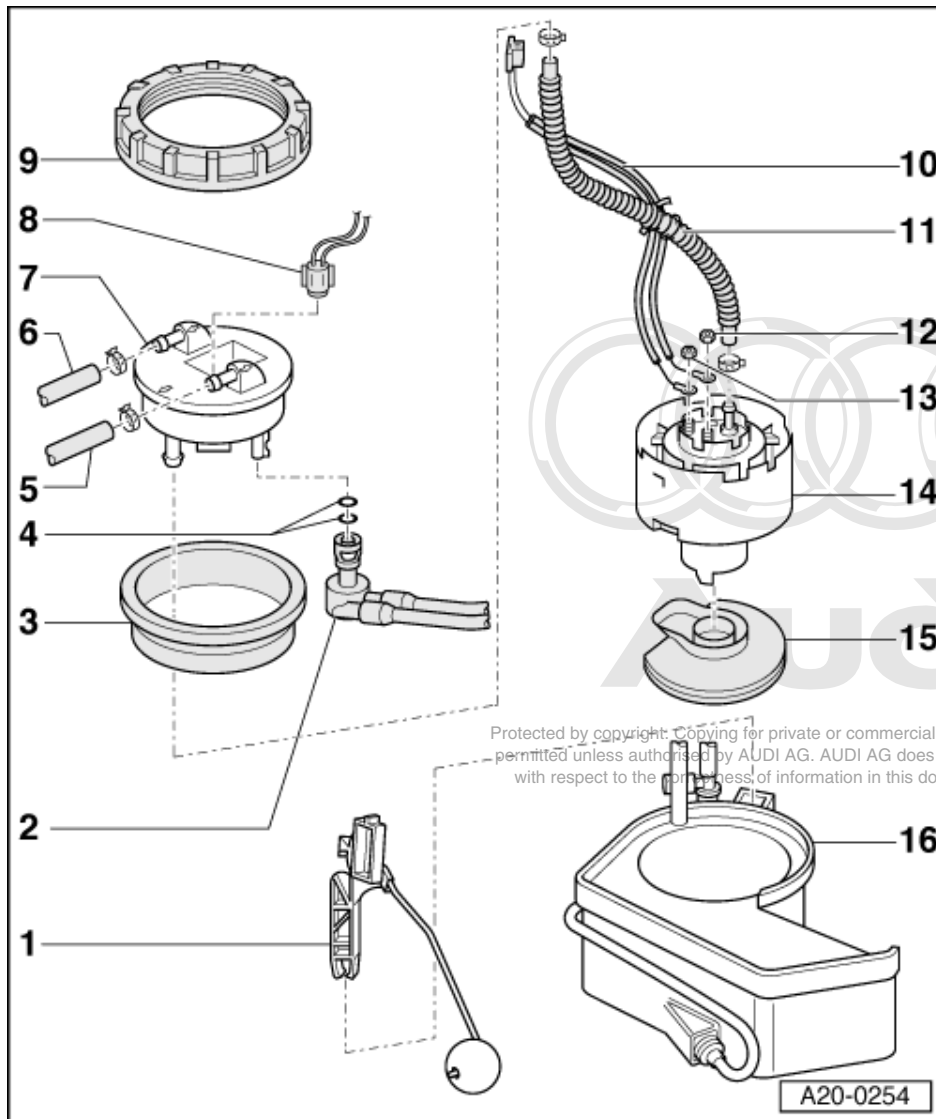
- ♦ Fit toothed washer under nut

14 Fuel delivery unit

- ♦ Removing and installing
=>Page **208**
- ♦ Checking fuel pump
=> Page **214**
- ♦ Checking holding pressure:

=> Motronic injection and ignition system (4-cylinder); Repair group 24; Servicing Motronic injection system; Testing fuel pressure, fuel pressure regulator and holding pressure Servicing Motronic injection system Testing fuel pressure, fuel pressure regulator and holding pressure

=> Motronic injection and ignition system (4-cylinder)07.96 ä;Repair Group 24; Servicing Motronic injection system; Testing fuel pressure regulator and holding pressure Servicing Motronic injection system Testing fuel pressure regulator and holding pressure



15 Fuel filter screen

- ♦ Cannot be replaced separately
- ♦ Clean if dirt has collected

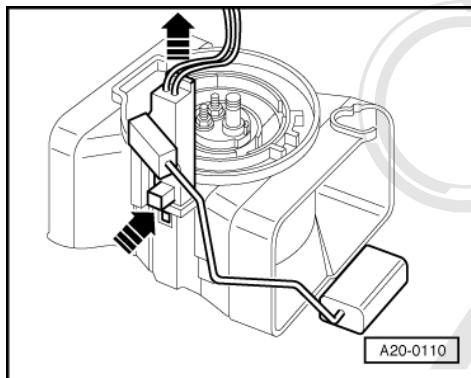
16 Baffle housing (lower section)

- ♦ Secured in place in fuel tank
- ♦ Cannot be dismantled

1.14 - Removing and installing fuel gauge sender (vehicles with four-wheel drive)

Removing

- Remove flange=>Removing fuel delivery unit, from Page 208 .
- Pull out flange carefully and place to one side with wiring and hoses connected.
- Unplug connector for fuel gauge sender on inside of flange.



- -> Press retaining tab, and at the same time pull the sender unit out of baffle housing in fuel tank -arrows-.

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Notes:

- ♦ The baffle housing is shown without the fuel tank for a clearer illustration.
- ♦ The sender unit and baffle housing shown are for vehicles with front-wheel drive.

Installing

- Insert fuel gauge sender into guide on outer section of baffle housing and press down until it clicks into place.
- Install flange=>Page 213 .
- After connecting battery, enter anti-theft code for radio

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch function.
- Set clock to correct time.

1.15 - Removing and installing fuel delivery unit (vehicles with four-wheel drive)

Observe notes => Page 174 .

Observe safety precautions=> Page 174

Observe rules for cleanliness => Page 175

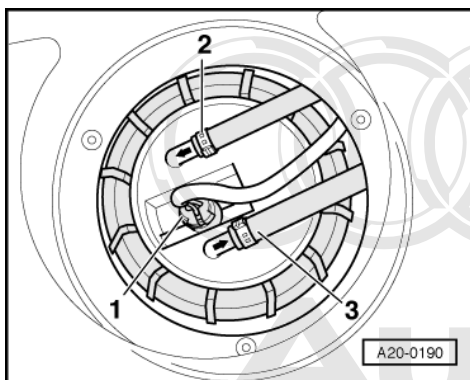
Special tools, testers and auxiliary items

- ♦ Ring nut spanner 3217
- ♦ Fuel pump spanner 3307
- ♦ Hose clamp pliers V.A.G 1275
- ♦ Fuel extractor V.A.G 1433 A

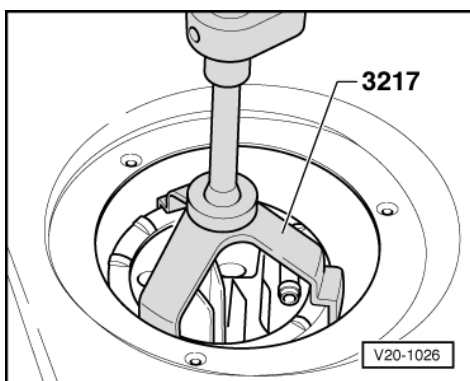
Removing

Notes:

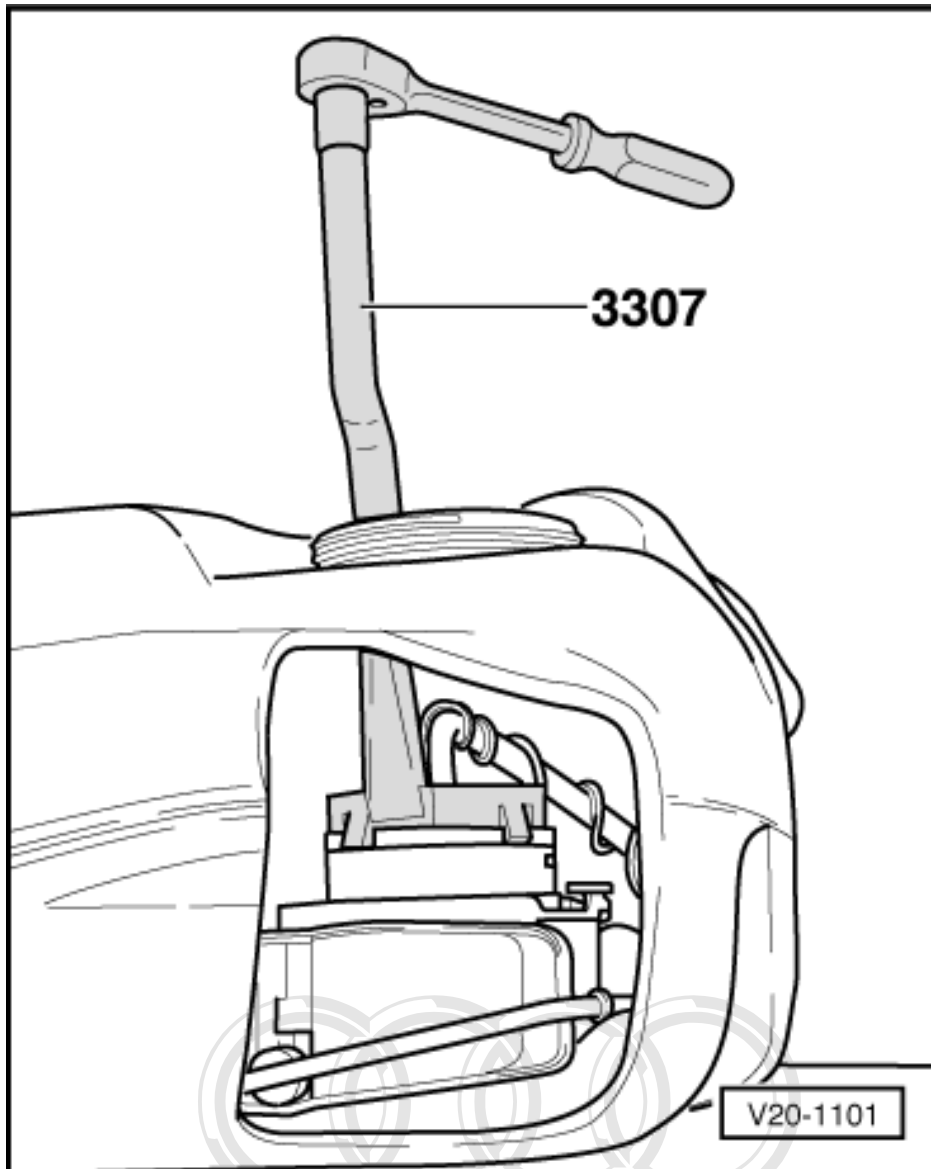
- ♦ The fuel tank must not be more than 1/3 full.
- ♦ If necessary, drain tank using fuel extractor V.A.G 1433 A.
- Obtain radio code on vehicles with coded radio.
- With ignition switched off, disconnect battery earth strap.



- Detach trim in luggage compartment.
- Unbolt cover for flange on fuel tank under floor trim in luggage compartment.
- -> Mark the supply pipe -2- and return pipe -3-, then pull pipes off flange.
- Release 4-pin connector -1- and unplug.



- -> Remove union nut with spanner 3217.
- Remove flange and seal out of opening in fuel tank.
- Unplug connector for fuel gauge sender on inside of flange.
- Pull fuel return pipe off inside of fuel delivery unit flange (press release tabs).

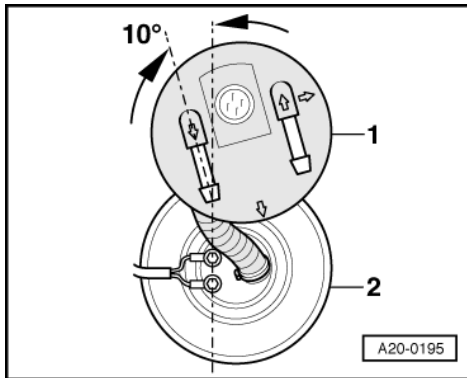


- -> Insert fuel pump spanner 3307 through opening in fuel tank and apply spanner to inner section of baffle housing.
- Using spanner 3307 turn inner section of baffle housing anti-clockwise as far as it will go (approx. 15°), and take out fuel pump with inner section of baffle housing.

Pre-assembling flange and inner section of baffle housing

- If flange has been separated from fuel delivery unit, pre-assemble components before installing=>Page 203 .

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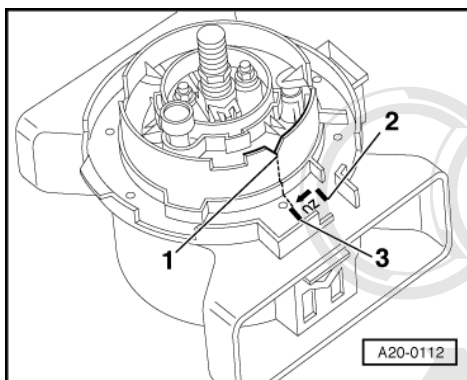


- -> Angle between flange and inner section of baffle housing: 10°
Compress clamps for supply pipe (between pump and flange) using hose clamp pliers V.A.G 1275.
Connect electrical wires onto fuel pump
(M4: 1.5 Nm; M5: 2 Nm)

Note:

Fit a toothed washer under each nut.

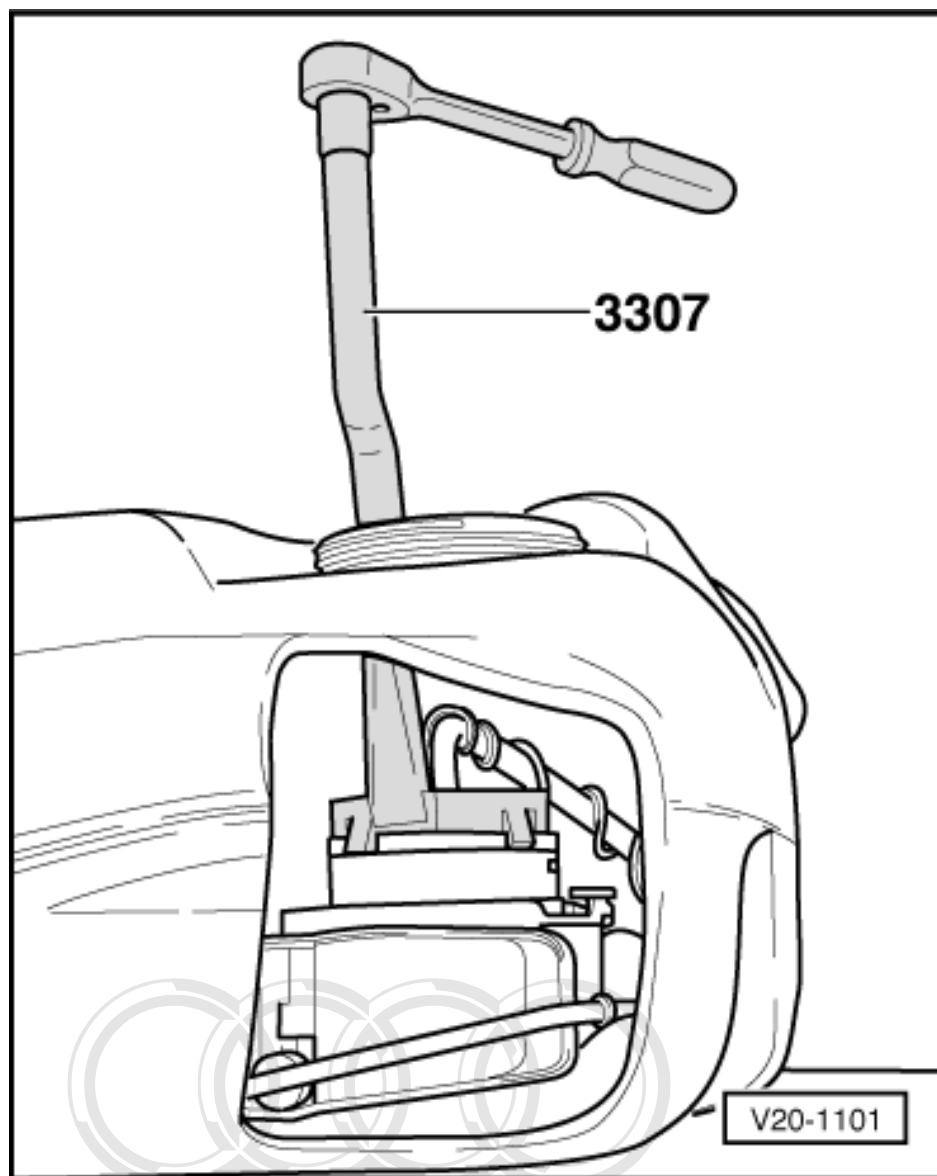
- Secure the electrical wires using a fuel-resistant cable tie.



Installing

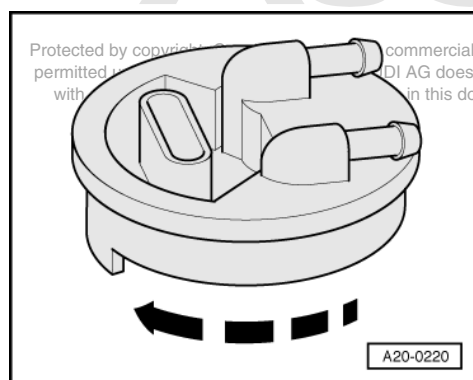
- Insert inner section of baffle housing, supply pipe and flange in fuel tank.
- -> Fit inner section of baffle housing into outer section of baffle housing (in tank) so that notch -1- on inner section of housing is aligned with marking -2- on outer section of housing.
- The inner section of baffle housing should move down noticeably.

Note:



Baffle housing is shown without fuel tank for a clearer illustration.

- -> Apply fuel pump spanner 3307 and turn pump together with inner section of baffle housing clockwise as far as it will go (approx. 15°). Notch -1- will then be aligned with marking -3- (bayonet fitting)=>Fig.A20-0112.



- -> When installing, turn flange in a clockwise direction, as indicated in illustration.
- Connect return pipe on inside of flange.

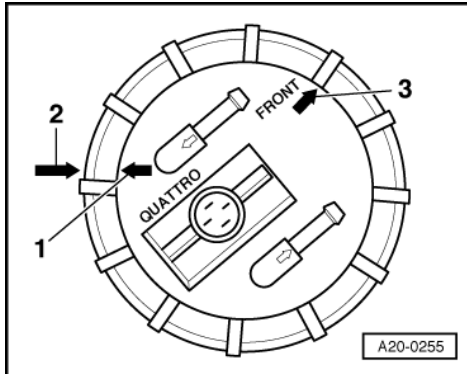
Note:

Lubricate O-rings with fuel or other lubricant.

- Wrap fuel gauge sender wire once around the return pipe (in fuel tank) and connect at flange.

Note:

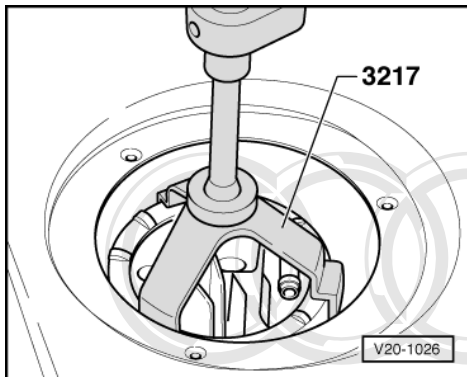
Lubricate the flange seal with fuel before fitting.



- -> Insert flange in fuel tank; note correct installation position:
 - Marking on flange must coincide with marking on fuel tank -arrows-.
 - Installation position for vehicles with four-wheel drive:
 - arrow 1- must be aligned with -arrow 2-.

Note:

-Arrow 3- is for vehicles with front-wheel drive (can be disregarded).



- -> Tighten union nut with spanner 3217.
- Connect pipes and plug in the connector.

Note:

Ensure that fuel pipes are securely seated.

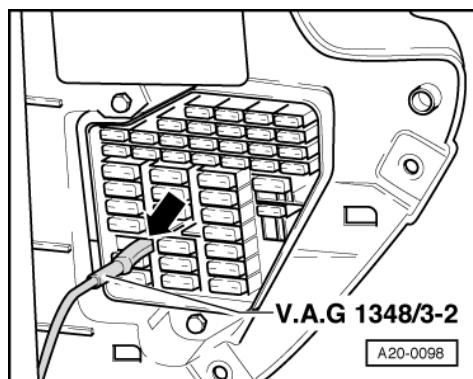
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Tightening torque

Component	Nm
Union nut for flange	60

1.16 - Connecting remote control

- Open fuse box cover on the left side of the dashboard panel.
- Pull fuse No. 28 off fuse carrier (left row, 5th large fuse from the top).



- -> Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 to fuse socket of fuse No. 28 -arrow-.
- Connect clamp to vehicle battery (+).

1.17 - Checking fuel pump

Note:

Checking fuel pressure, pressure regulator and holding pressure:

=> Motronic injection and ignition system (4-cylinder); Repair Group 24; Servicing Motronic injection system; Testing fuel pressure, fuel pressure regulator and holding pressure Servicing Motronic injection system Testing fuel pressure, fuel pressure regulator and holding pressure

=> Motronic injection and ignition system (4-cylinder) 07 96 ä; Repair Group 24; Servicing Motronic injection system; Testing fuel pressure regulator and holding pressure Servicing Motronic injection system Testing fuel pressure regulator and holding pressure

Requirements for test:

- Battery voltage not less than 12 V
- Fuse No. 28 OK
- Fuel filter OK

Test sequence

- Switch on ignition.

The fuel pump must run audibly (the help of a second mechanic will be required if the surrounding noise level is very high).

If the fuel pump does not run:

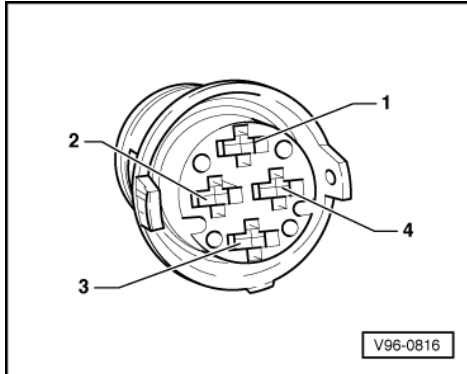
- Switch off ignition.
- Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 => Page 214 .
- Operate remote control.

If the fuel pump runs:

- Test fuel pump relay:

=> Motronic injection and ignition system (4-cylinder); Repair Group 24; Servicing Motronic injection system; Testing fuel pump relay and activation Servicing Motronic injection system Testing fuel pump relay and activation

=> Motronic injection and ignition system (4-cylinder) 07.96 ä; Repair Group 24; Servicing Motronic injection system; Testing fuel pump relay Servicing Motronic injection system Testing fuel pump relay



If the fuel pump does not run:

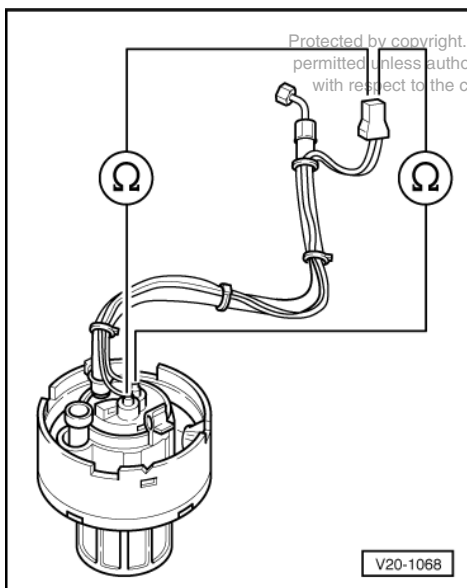
- Detach trim in luggage compartment.
- Detach cover for fuel tank flange under luggage compartment trim.
- Release catch and unplug 4-pin connector.
- -> Use voltmeter to test voltage between contact 1 (green/yellow) and contact 4 (brown).
- Operate remote control.
 - Specification: approx. battery voltage

If the specification is not attained:

- Locate and eliminate open circuit using current flow diagram:

=> Current flow diagrams, Electrical fault-finding and Fitting locations

If the specification is attained:



- Remove union nut with spanner 3217.
- Detach flange.



- -> Check that the electrical wires between flange and fuel pump are connected and test for continuity.

If no open circuit can be found:

Fuel pump defective.

- Renew fuel pump=>Page 208 .

1.18 - Checking fuel pump delivery rate

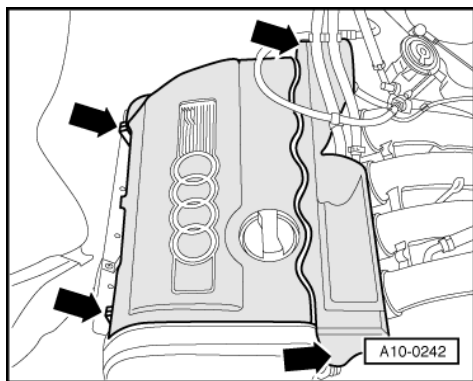
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Requirements for test:

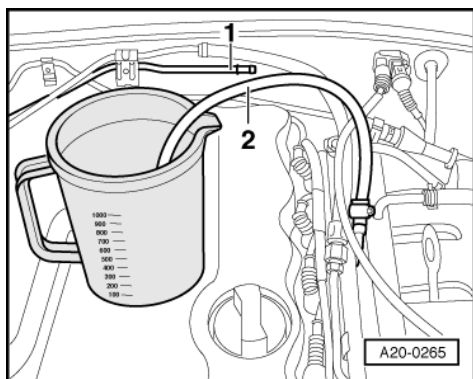
- Battery voltage at least 12 V
- Power supply wiring OK.
- Fuel filter OK

Test sequence

- Switch off ignition.



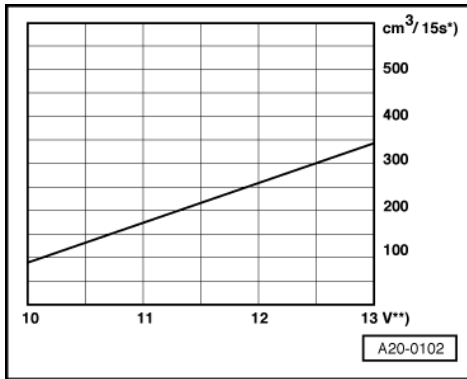
- -> Remove cover panel above injectors -right arrow-.
- Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 => Page 214 .
- Remove fuel filler cap.



Warning!

Fuel system is under pressure! Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

- -> Disconnect fuel return hose -2- from pipe connection -1- on bulkhead.
- Hold end of fuel return hose in measuring container.
- Operate remote control for 15 seconds (keep button pressed).

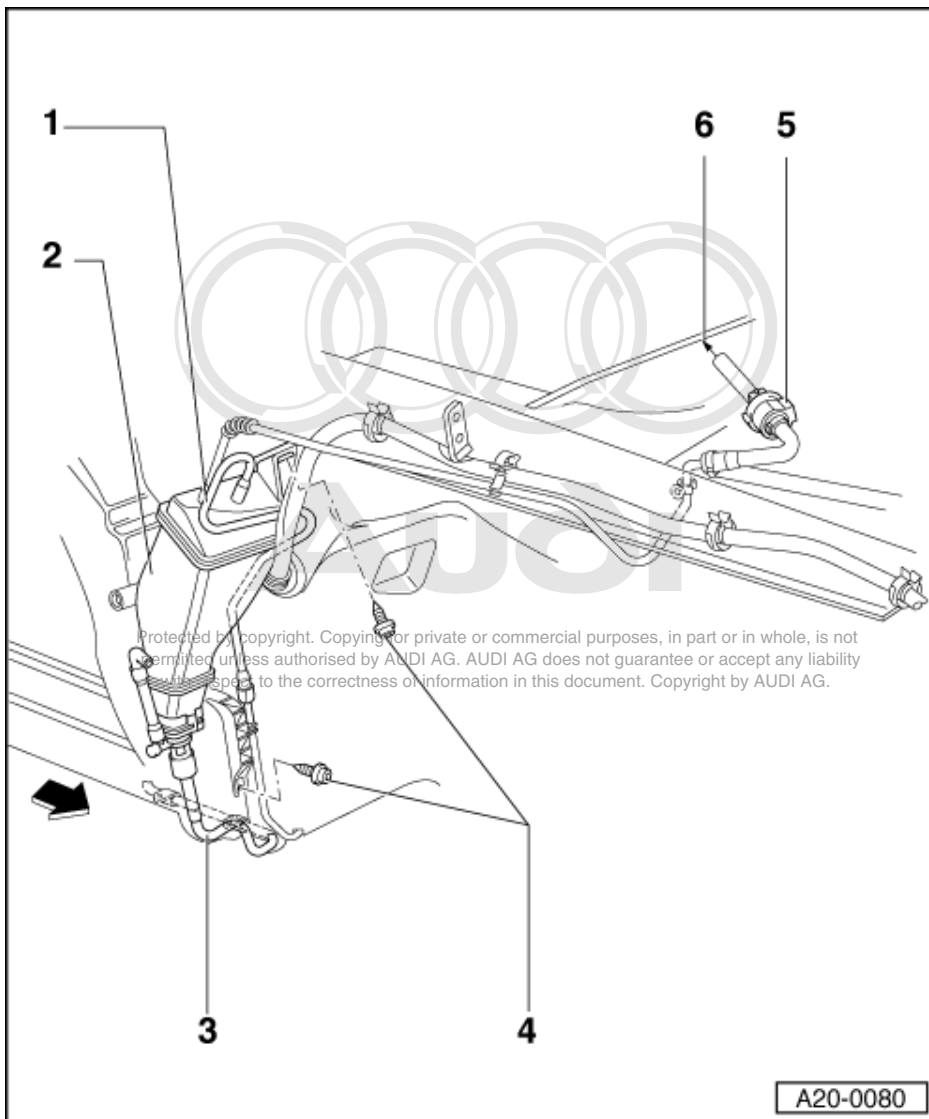


- -> Compare amount of fuel delivered with specification.

*) Minimum delivery cm³/15 seconds

**) Voltage at fuel pump with engine stationary and pump running (approx. 2 volts less than battery voltage).

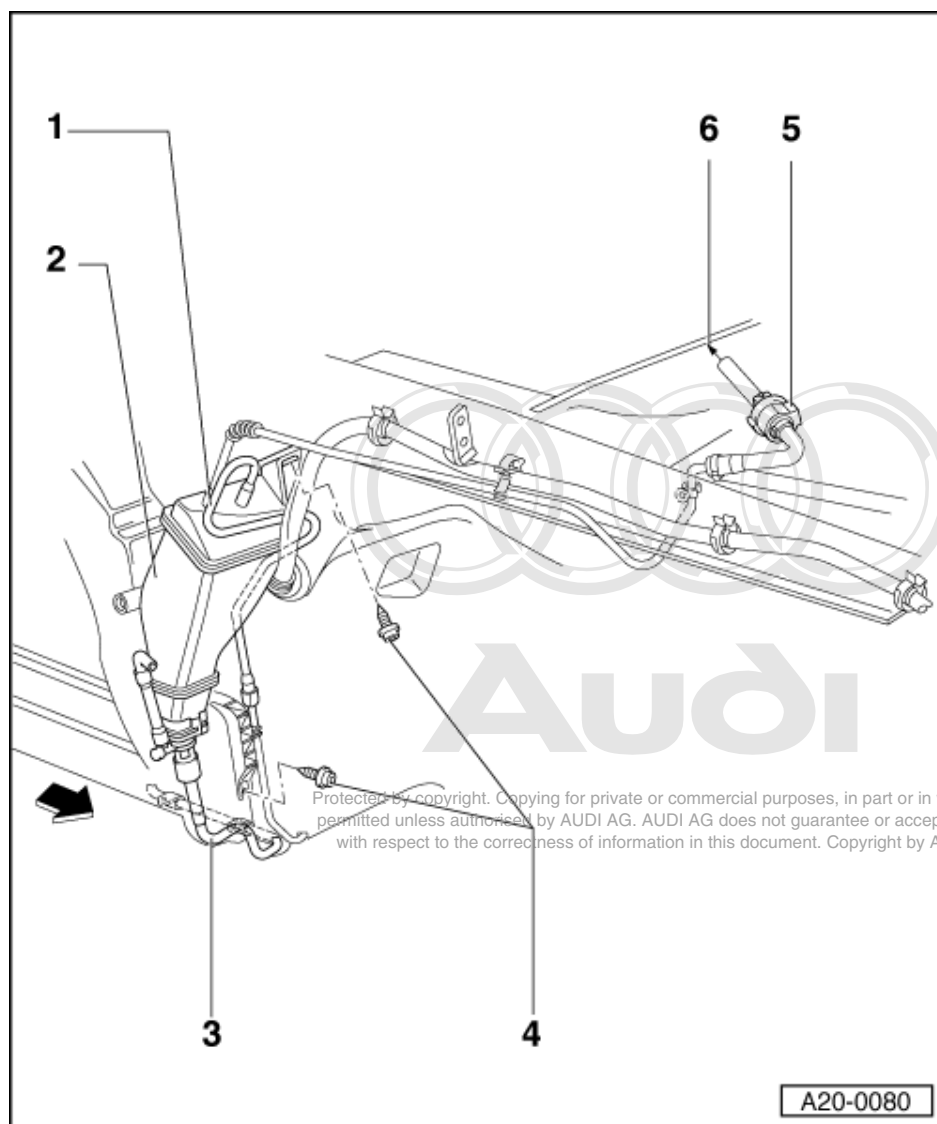
1.19 - Removing and installing parts of activated charcoal filter system



Note:

Arrow in illustration points in direction of travel

- 1 Vent pipe
- 2 Activated charcoal filter
 - ♦ Location: behind wheel housing liner, front right
- 3 Breather pipe
 - ♦ Open to atmosphere; comes out at vehicle floor, right side



- 4 10 Nm
- 5 Activated charcoal filter solenoid valve 1 -N80
 - ♦ Checking operation and activation:

=> Motronic injection and ignition system (4-cylinder); Repair Group 24; Testing control unit input signals; Testing solenoid valve 1 for activated charcoal filter -N80 Testing control unit input signals Testing solenoid valve 1 for activated charcoal filter -N80

=> Motronic injection and ignition system (4-cylinder)07.96 ä; Repair Group 24; Testing fuel tank breather system; Testing solenoid valve 1 for activated charcoal filter Testing fuel tank breather system Testing solenoid valve 1 for activated charcoal filter

6 To intake manifold

2 - Servicing accelerator mechanism

2.1 - Servicing accelerator mechanism

2.2 - Removing and installing throttle cable

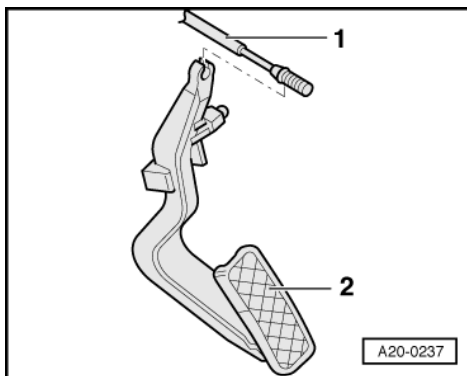
Notes:

- ◆ The throttle cable is very sensitive to kinking and must therefore be handled carefully when installing.
- ◆ A single slight kink can cause it to break when driving. Kinked cables must not be installed.
- ◆ When installing the throttle cable, ensure that it is aligned straight between its supporting mounts and the cable attachment points.

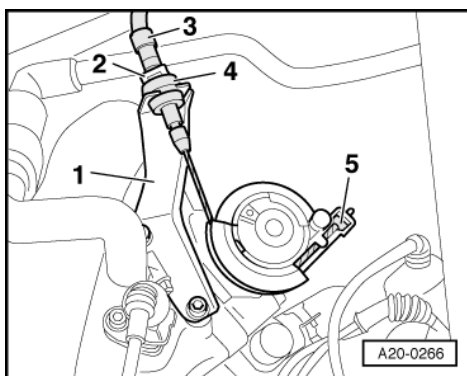
Removing

- Remove driver's storage compartment:

=> General body repairs; Repair group 70; Dash panel; Removing driver's storage compartment Dash panel
Removing driver's storage compartment



- -> Disengage end of throttle cable -1- at top of accelerator pedal -2-.

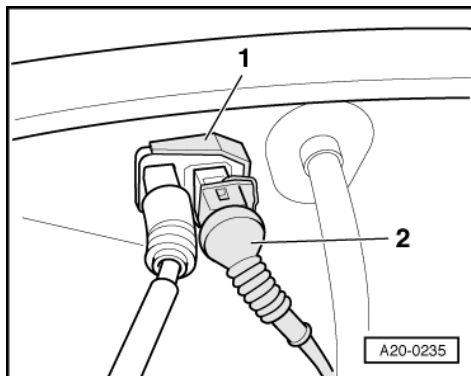


- -> Disengage nipple -5- on end of throttle cable from cable cam.
- Pull grooved section of cable sheath -3- out of rubber grommet -4- at support bracket -1-.

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Vehicles with automatic gearbox



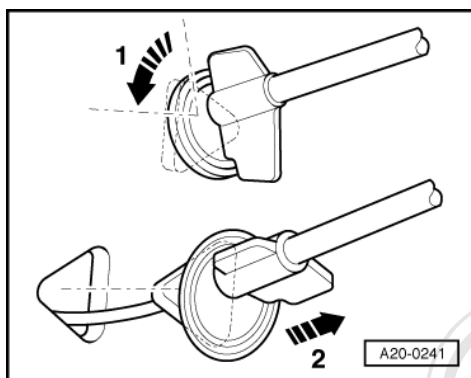
- -> Unplug connector -2- on kickdown switch.

All models

- Pull securing clip -1- off throttle cable mounting or kickdown switch.

Note:

In vehicles with manual gearbox the securing clip is behind the bulkhead.

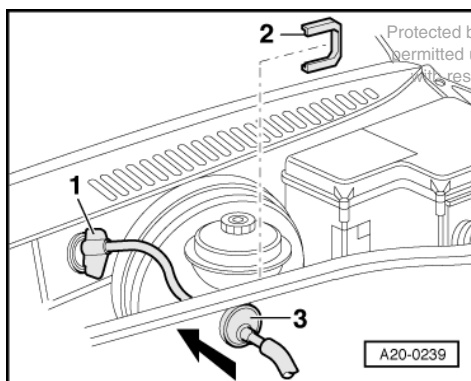


- -> Turn throttle cable retainer approx. 90° anti-clockwise -arrow 1- and pull out of bulkhead in plenum chamber -arrow 2-.
- Take out throttle cable.

Installing

- Refer to notes => Page 219 .

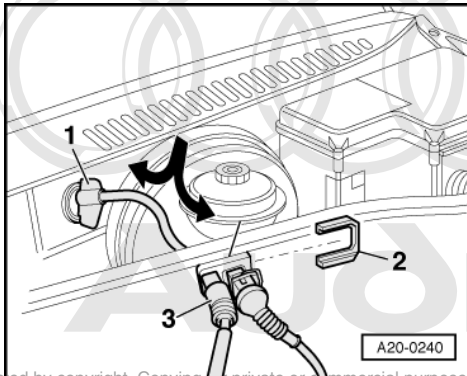
Vehicles with manual gearbox



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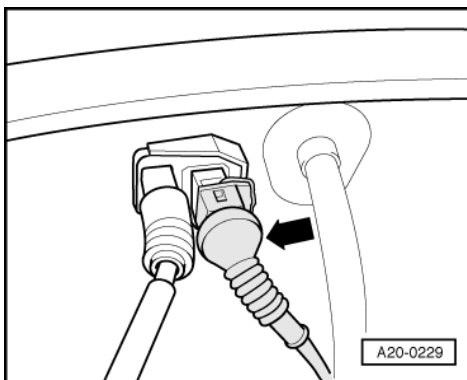
- -> Working from the engine compartment, run the throttle cable with throttle cable mounting -3- and throttle cable retainer -1- through the two partition panels (in direction indicated by arrow).
- Secure throttle cable mounting behind bulkhead in plenum chamber with securing clip -2-.

Vehicles with automatic gearbox

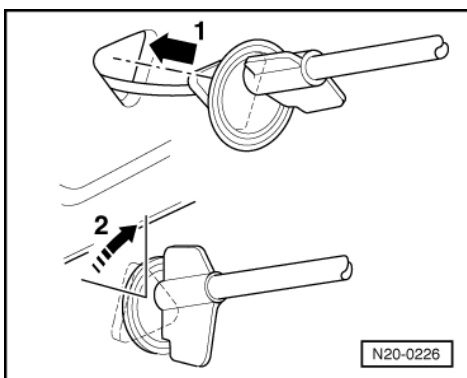


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- -> Working from the plenum chamber run the throttle cable with throttle cable mounting -3- and throttle cable retainer -1- through the front bulkhead towards the engine and through the rear bulkhead towards the interior (direction indicated by arrow).
- Secure throttle cable mounting in front of front bulkhead with securing clip -2- .



- -> Plug connector onto kickdown switch -arrow-.



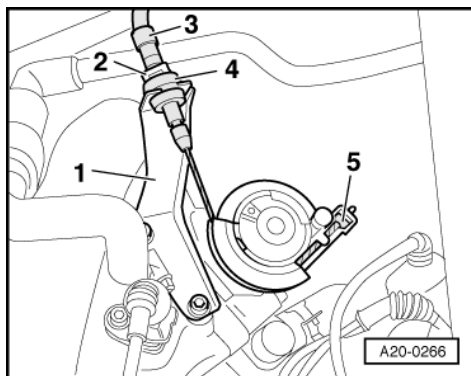
- -> After inserting throttle cable retainer in rear bulkhead -arrow 1-, secure by turning approx. 90° clockwise -arrow 2-.

All models

The remaining installation steps are carried out in the reverse sequence - note the following points:

- Adjust throttle cable => Page [222](#) .

2.3 - Adjusting throttle cable



- -> Throttle cable -5- attached to accelerator pedal and to cable cam on throttle valve control part.
- Pull securing clip -2- off grooved section of throttle cable sheath -3-.
- Depress accelerator pedal into full throttle position.

Note:

A second mechanic is required for this step or use a spring tensioning rod braced against the steering wheel.

Vehicles with manual gearbox

- Adjust throttle cable by re-positioning securing clip -2- at rubber grommet -4- on support bracket -1- so that throttle valve is at full throttle position.

Vehicles with automatic gearbox

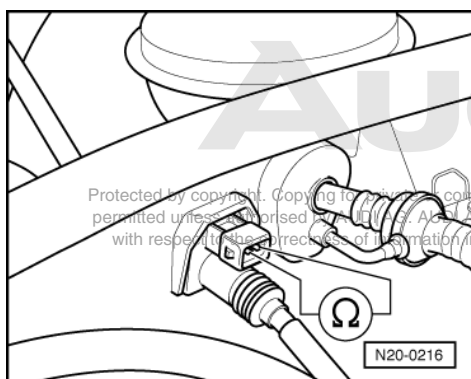
- Adjust throttle cable by re-positioning securing clip -2- at rubber grommet -4- on support bracket -1- so that throttle valve is fully open and kickdown switch clicks audibly.

All models

- Release accelerator pedal or remove spring tensioning rod.
- After adjusting the throttle cable, check position of throttle valve at idling speed and full throttle stops.

Checking adjustment (vehicles with automatic gearbox)

- Pull 2-pin connector off kick-down switch (F8) in engine compartment (on the bulkhead).



- -> Connect hand multimeter V.A.G 1526 with aux. cables from V.A.G 1594 to kick-down switch.
- Check resistance at switch.
 - Specification: $\infty \Omega$
- Slowly move accelerator pedal in direction of full throttle.
 - The reading must drop to 0 Ω shortly after resistance to movement is felt at kick-down point.

- At this point the accelerator pedal should be just short of the end stop.



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26 - Exhaust system

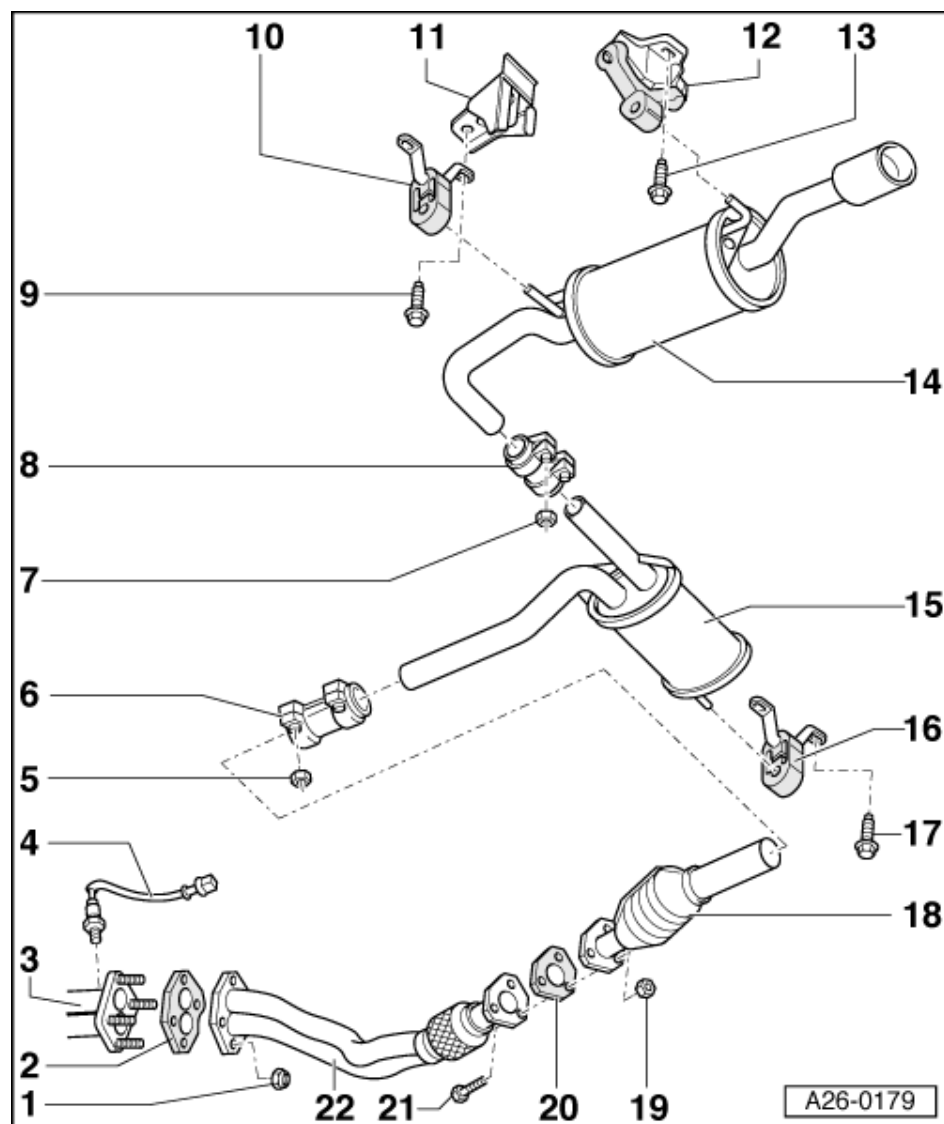
1 - Removing and installing parts of exhaust system

1.1 - Removing and installing parts of exhaust system

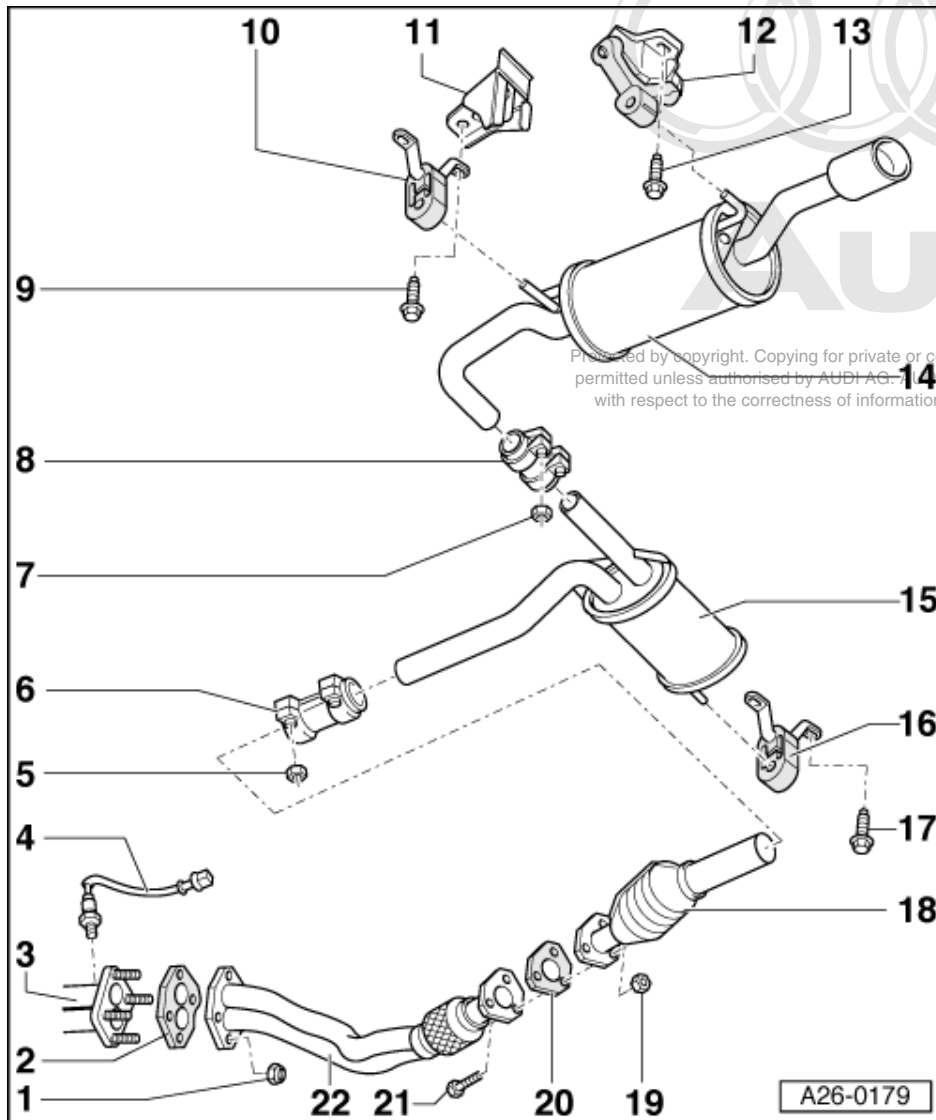
Notes:

- ♦ Always renew seals, gaskets and self-locking nuts.
- ♦ After working on the exhaust system ensure that the system is not under stress, and that it has sufficient clearance from the bodywork. If necessary loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the bodywork at all points and the mountings are evenly loaded.
- ♦ The flexible pipe connection (de-coupling element) in the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.

1.2 - Vehicles with front-wheel drive



- 1 30 Nm
 - ♦ Renew
- 2 Gasket
 - ♦ Renew
- 3 Exhaust manifold
 - ♦ Removing and installing
=> Page 236
- 4 Lambda probe, 50 Nm
 - ♦ Grease only the threads with high-temperature lubricant G 052 112 A3. The lubricant must not get into the slots on the probe body.



- ♦ Checking:

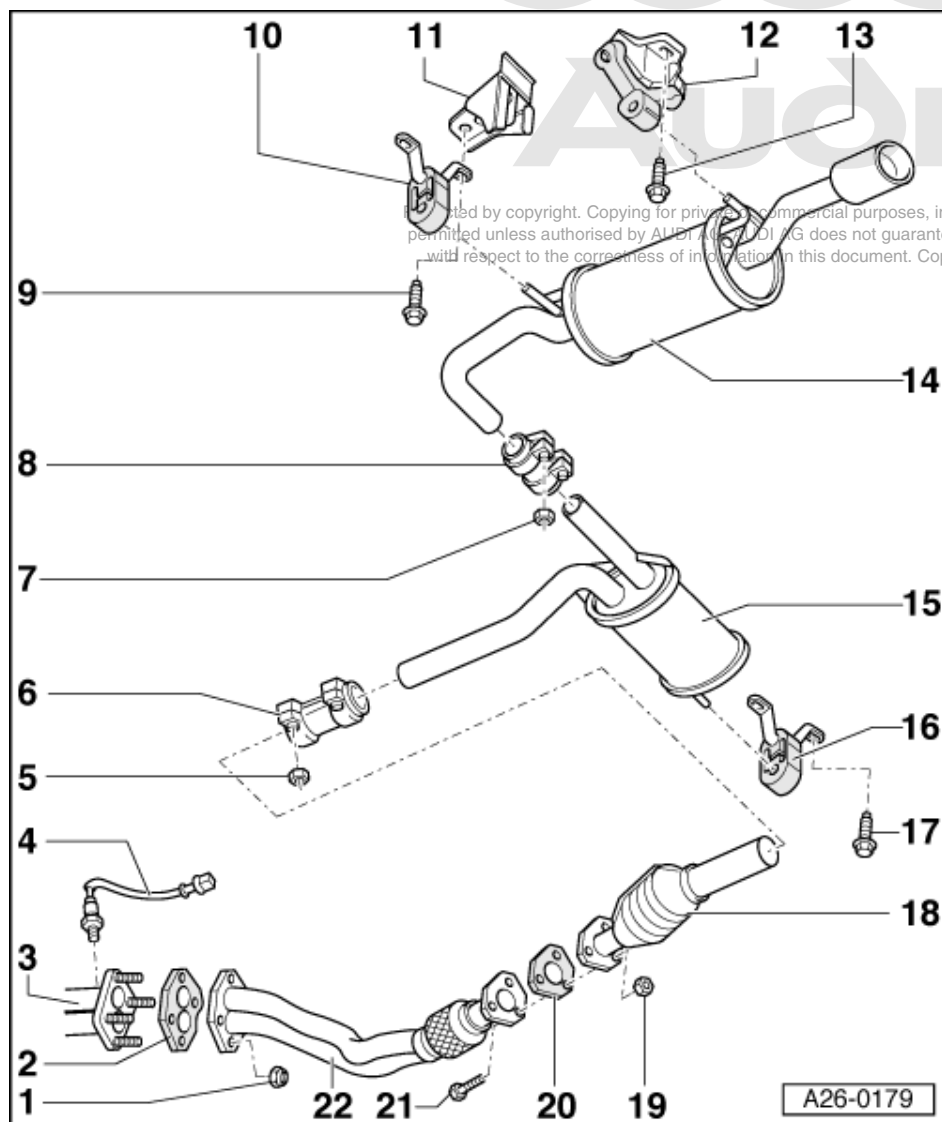
=> Motronic injection and ignition system (4-cylinder); Repair Group 24: Testing lambda control
 => Motronic injection and ignition system (4-cylinder) 07.96 ä; Repair group 24; Testing lambda control Testing lambda control
 ♦ Unplugging lambda probe connector => Page 237

- 5 40 Nm
- 6 Clamp
 - ♦ Align exhaust system so it is free of stress before tightening clamp => Page 238 .
 - ♦ Installation position:



bolted connection facing to the left.

- ♦ Position of bolts => Fig. 1
- ♦ Tighten bolted connections evenly.



7 40 Nm

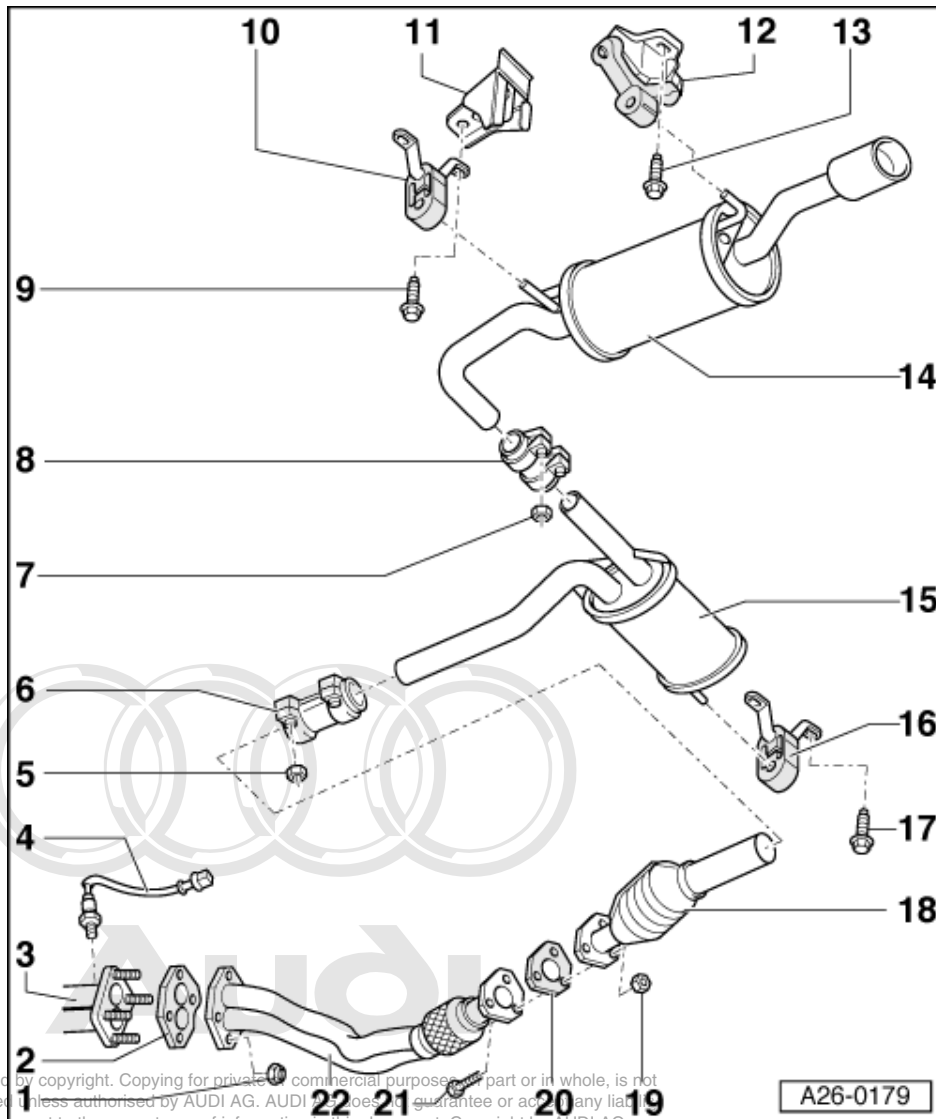
8 Clamp

- ♦ For separate replacement of front and rear silencers
- ♦ Align exhaust system so it is free of stress before tightening clamp => Page 238.
- ♦ Installation position: bolted connection facing to the rear
- ♦ Position of bolts => Fig. 1
- ♦ Tighten bolted connections evenly.

9 25 Nm

10 Mounting

11 Stop



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12 Mounting

13 25 Nm

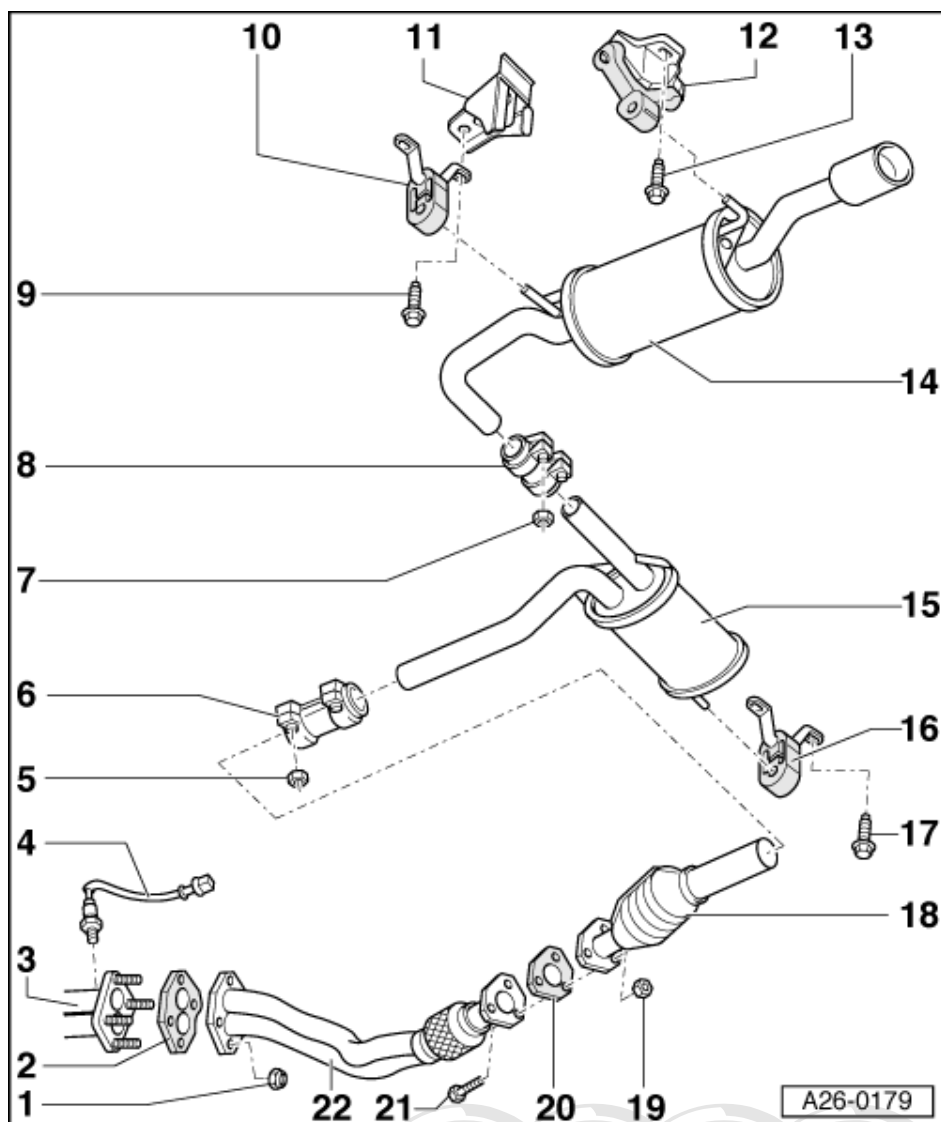
14 Rear silencer

- ♦ Rear silencer and front silencer are one unit as original equipment, but can be renewed separately for repair purposes.
- ♦ Cutting point => Page 235
- ♦ Aligning exhaust system free of stress => Page 238

15 Front silencer

- ♦ Front and rear silencers are one unit as original equipment, but can be renewed separately for repair purposes
- ♦ Cutting point => Page 235
- ♦ Aligning exhaust system free of stress => Page 238

16 Mounting



17 25 Nm

18 Catalytic converter

- ◆ Protect from damage by knocks and impact

19 25 Nm

- ◆ Renew

20 Gasket

- ◆ Renew

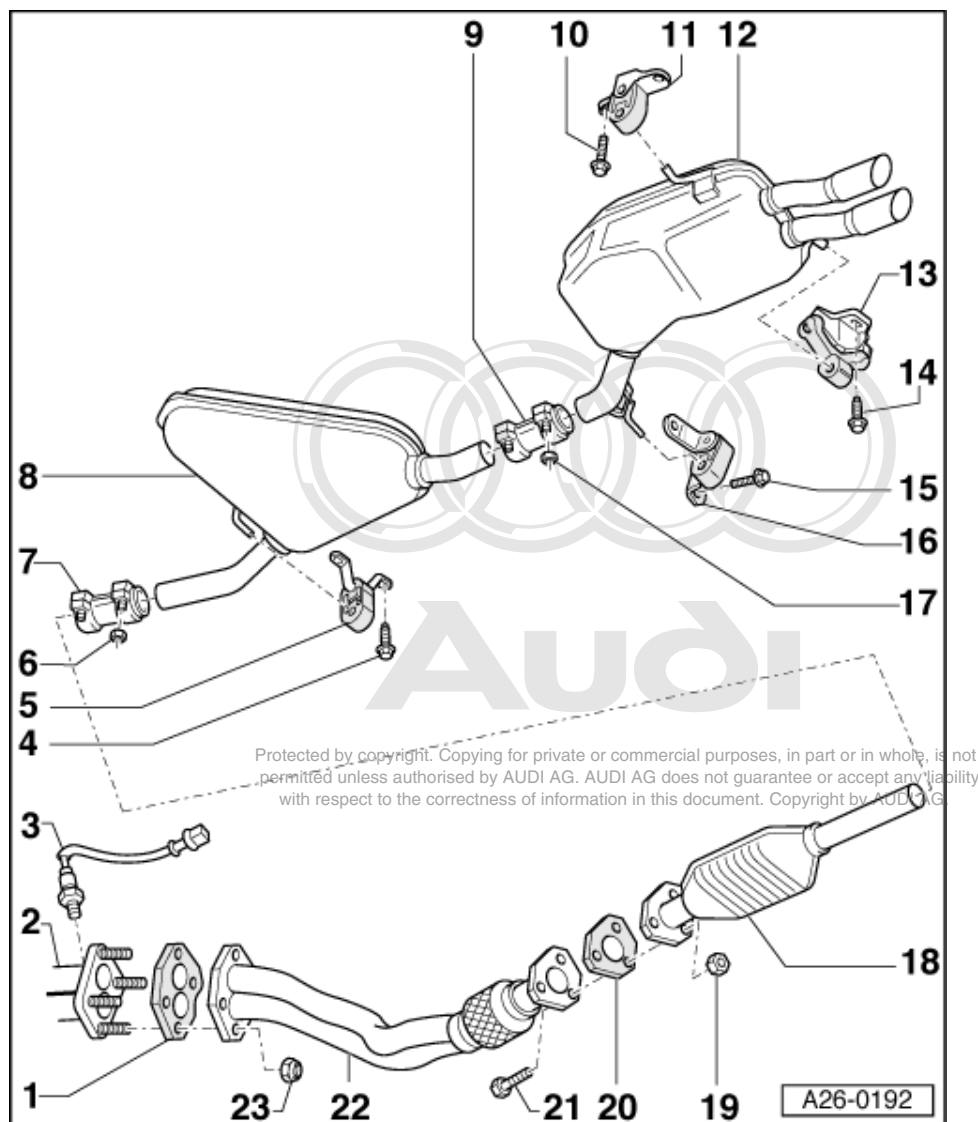
21 25 Nm

22 Front exhaust pipe

- ◆ With flexible connection (de-coupling element)
- ◆ Do not bend flexible connection more than 10° - otherwise it can be damaged
- ◆ To remove, unbolt floor cross member (20 Nm)
- ◆ Aligning exhaust system free of stress => Page 238

or cross member (20 Nm)
 tem free of stress => Page 238
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1.3 - Vehicles with four-wheel drive



1 Seal

- ♦ Renew

2 Exhaust manifold

- ♦ Removing and installing
=> Page 236

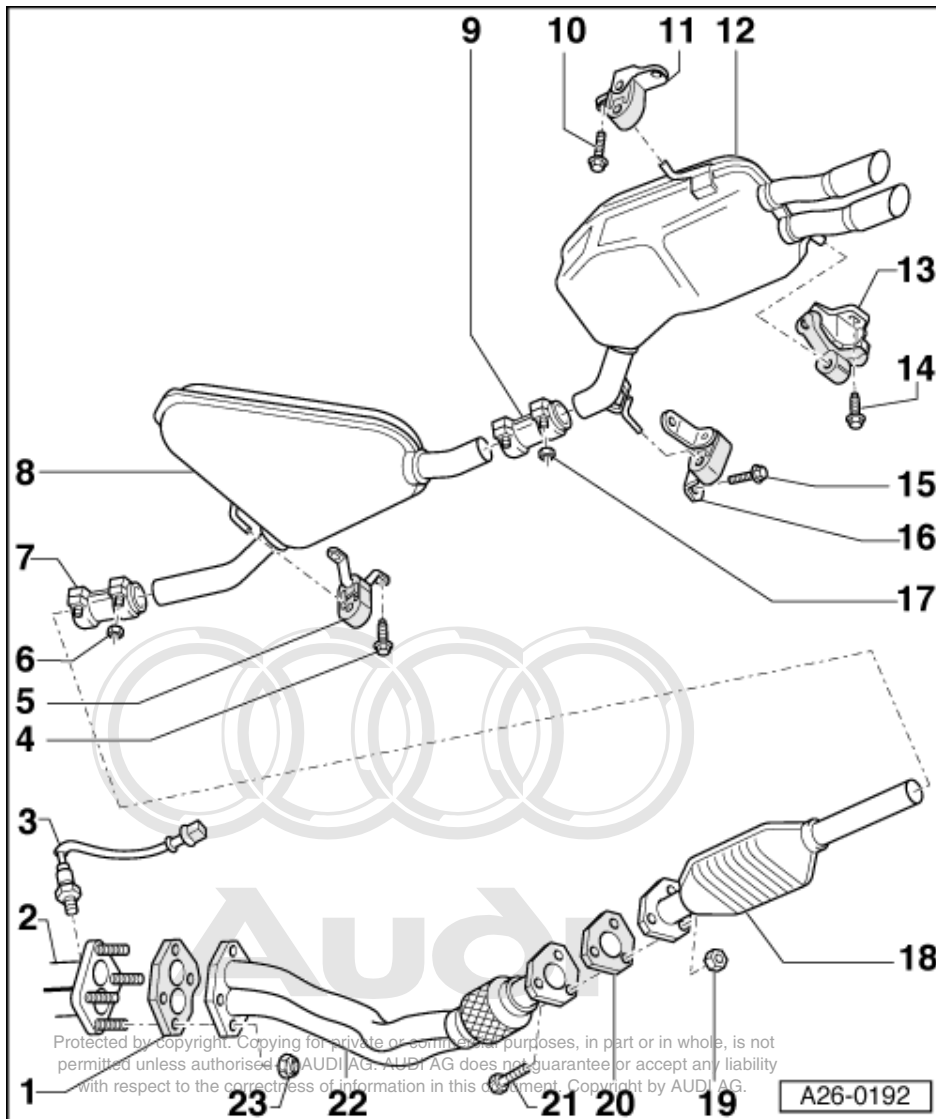
3 Lambda probe, 50 Nm

- ♦ Grease only the threads with high-temperature lubricant G 052 112 A3. The lubricant must not get into the slots on the probe body.
- ♦ Checking:

=> Motronic injection and ignition system (4-cylinder); Repair Group 24: Testing lambda control

=> Motronic injection and ignition system (4-cylinder) 07.96 ä; Repair group 24; Testing lambda control Testing lambda control

- ♦ Unplugging lambda probe connector => Page 237



4 25 Nm

5 Mounting

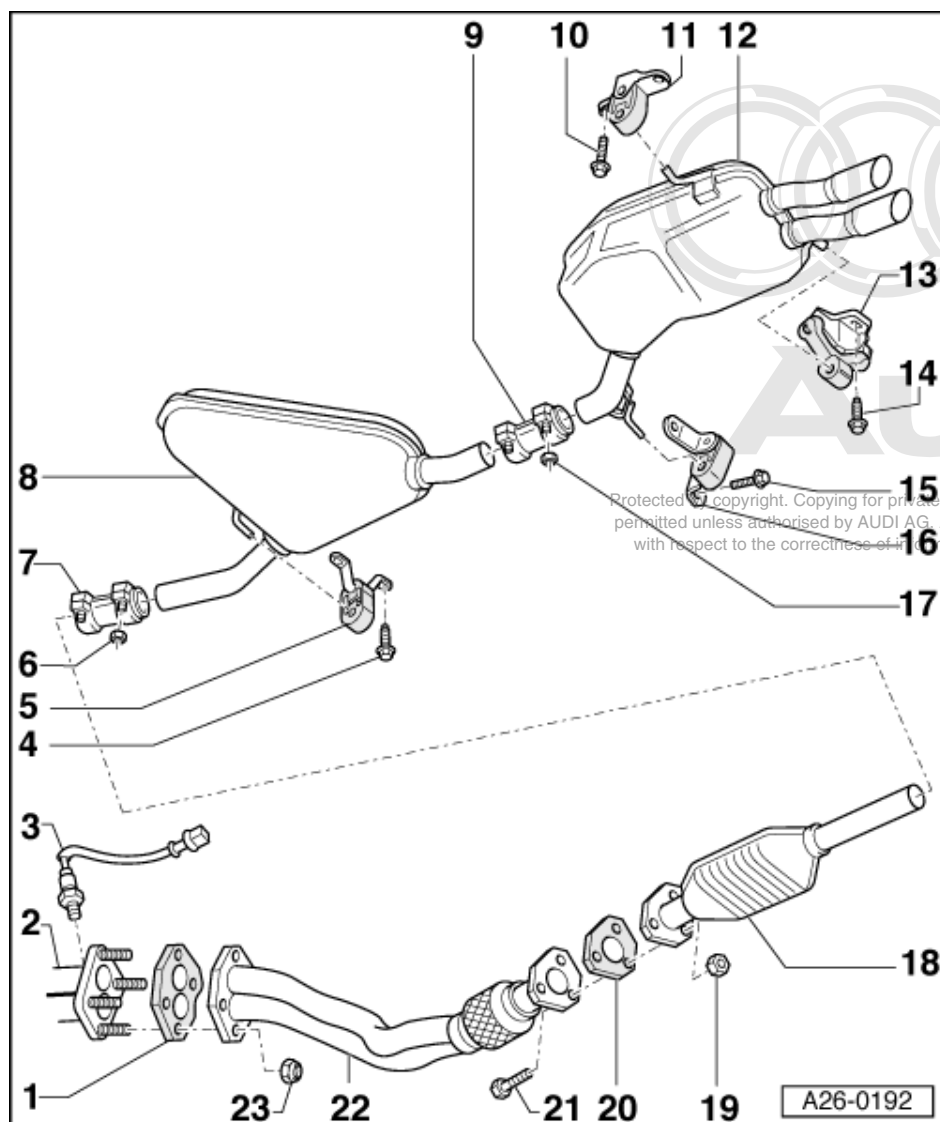
6 40 Nm

7 Clamp

- ♦ Align exhaust system so it is free of stress before tightening clamp => Page 238 .
- ♦ Installation position:
bolted connection facing to the left.
- ♦ Position of bolts => Fig. 1
- ♦ Tighten bolted connections evenly.

8 Front silencer

- ♦ Front and rear silencers are one unit as original equipment, but can be renewed separately for repair purposes
- ♦ Cutting point => Page 235
- ♦ Aligning exhaust system free of stress => Page 238



9 Clamp

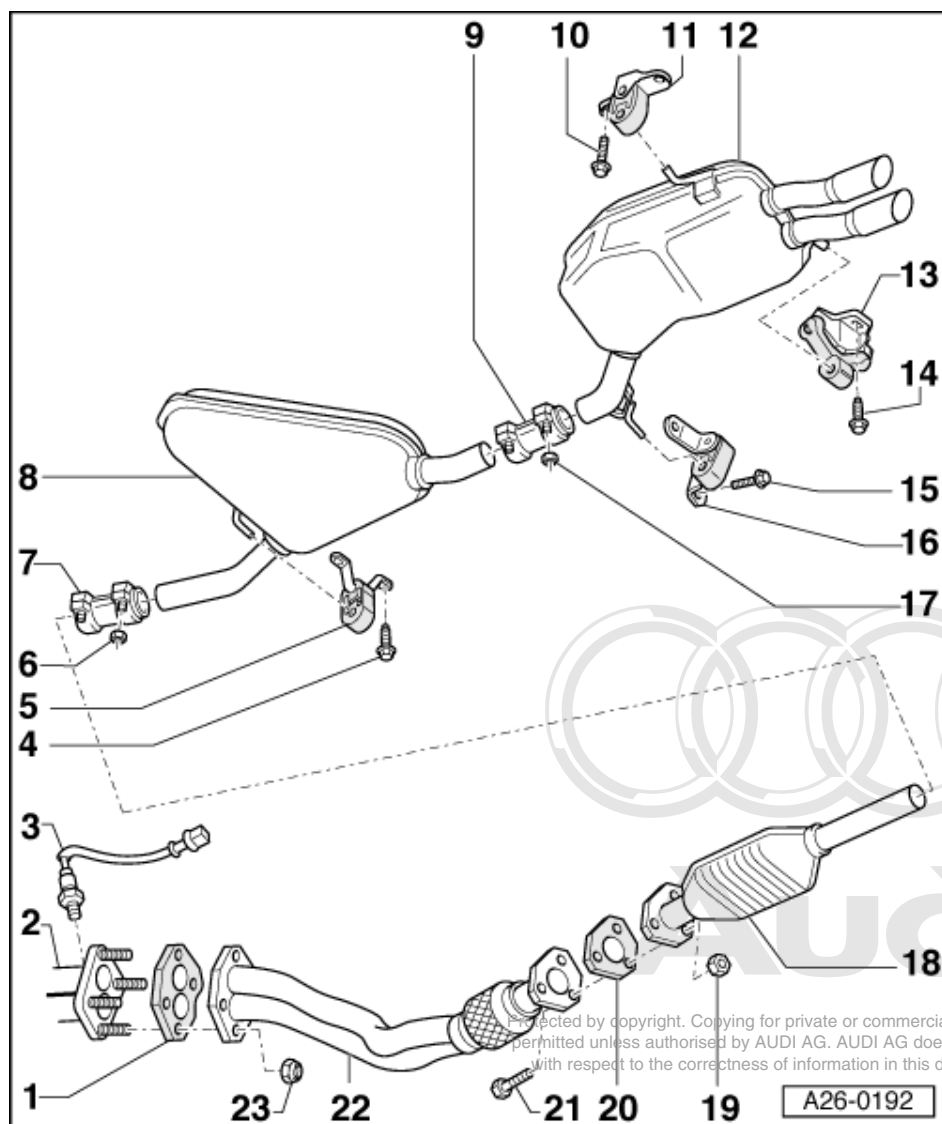
- ♦ For separate replacement of front and rear silencers
- ♦ Align exhaust system so it is free of stress before tightening clamp => Page 238 .
- ♦ Installation position:
bolted connection facing to the left.
- ♦ Position of bolts => Fig. 1
- ♦ Tighten bolted connections evenly.

10 25 Nm

11 Mounting

12 Rear silencer

- ♦ Rear silencer and front silencer are one unit as original equipment, but can be renewed separately for repair purposes.
- ♦ Cutting point => Page 235
- ♦ Aligning exhaust system free of stress => Page 238



13 Mounting

14 25 Nm

15 25 Nm

16 Mounting

17 40 Nm

18 Catalytic converter

- ♦ Protect from damage by knocks and impact

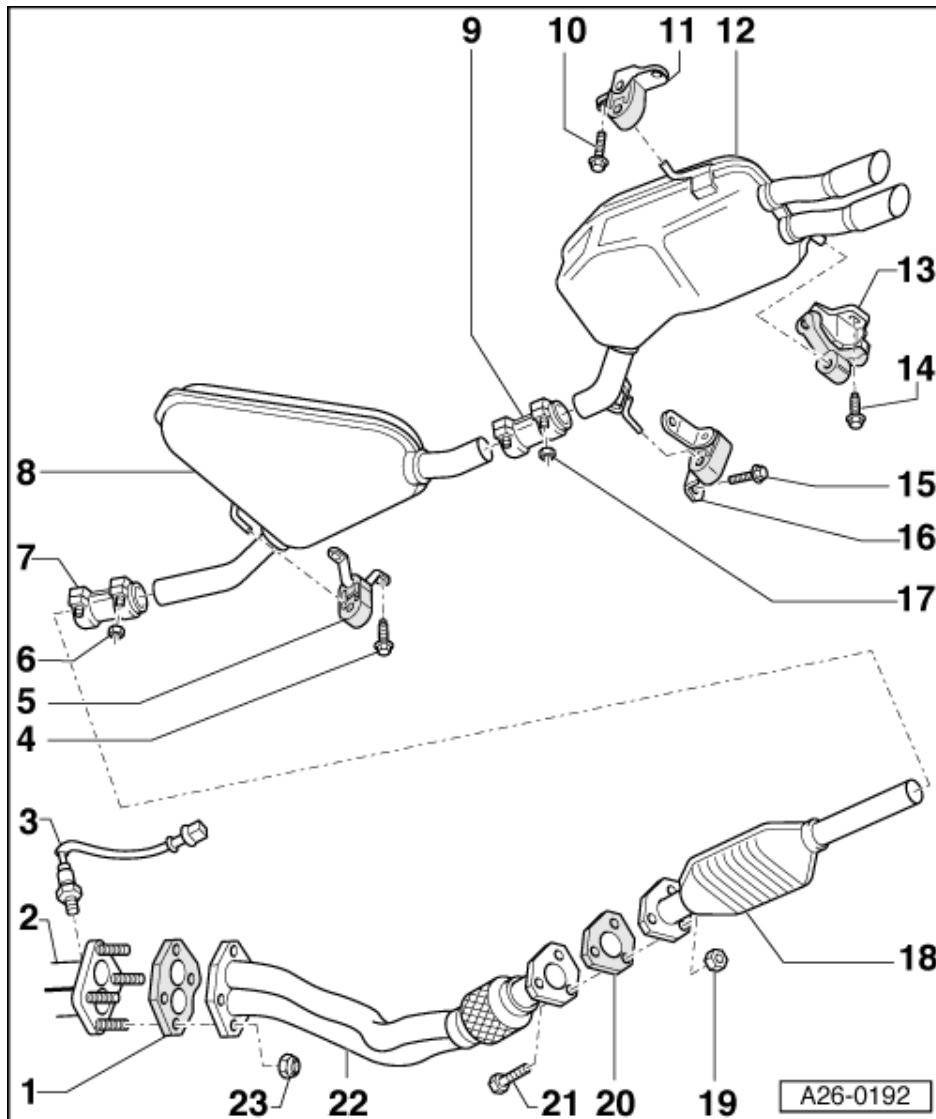
19 25 Nm

- ♦ Renew

20 Gasket

- ♦ Renew

21 25 Nm

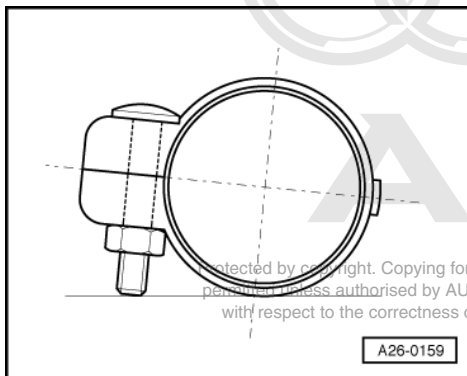


22 Front exhaust pipe

- ◆ With flexible connection (de-coupling element)
- ◆ Do not bend flexible connection more than 10° - otherwise it can be damaged
- ◆ Exhaust mountings on vehicles with rough-road suspension => Fig. 2
- ◆ To remove, unbolt floor cross member (20 Nm)
- ◆ Aligning exhaust system free of stress => Page 238

23 30 Nm

- ◆ Renew

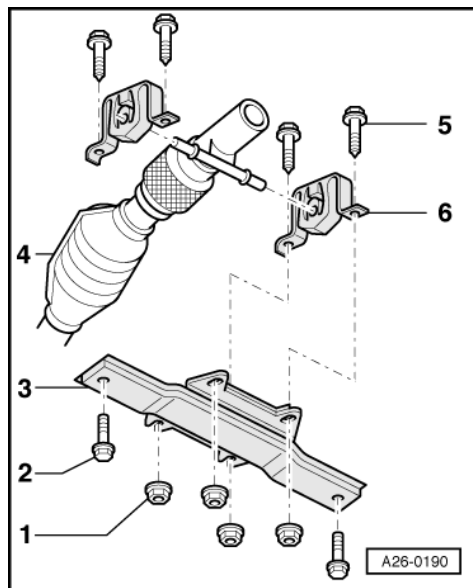


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A26-0159

-> Fig.1 Installation position of clamp

- Install the clamps so that the ends of the bolts -arrow- are not below the bottom circumference of the clamps.



-> Fig.2 Components of exhaust pipe mountings

(vehicles with rough-road suspension)

- 1 - Nut, self-locking - 25 Nm
- 2 - Bolt - 25 Nm
- 3 - Cross-piece
- 4 - Front exhaust pipe with flexible connection
- 5 - Bolt - 25 Nm
- 6 - Mounting

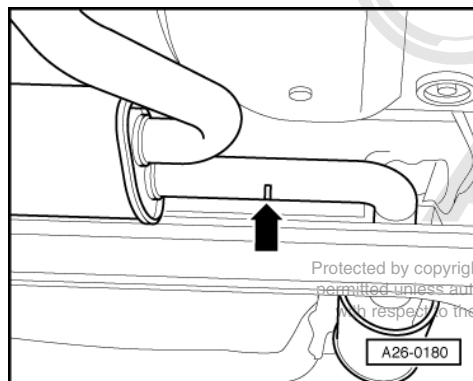
1.4 - Separating front and rear silencers

- ♦ The connecting pipe can be cut through at the point marked in order to renew the front and rear silencers separately.
- ♦ The cutting point is marked with an indentation on the outside of the exhaust pipe.

Special tools, testers and auxiliary items

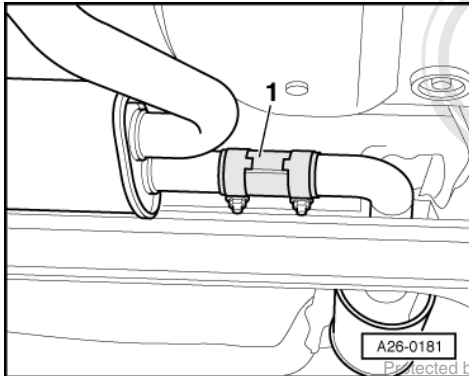
- ♦ Body repair saw V.A.G 1523

Vehicles with front-wheel drive:



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- -> Cut through exhaust pipe at right angles with body saw (e.g. V.A.G 1523) at the position marked -arrow-.
- When installing, position clamp centrally over saw-cut.



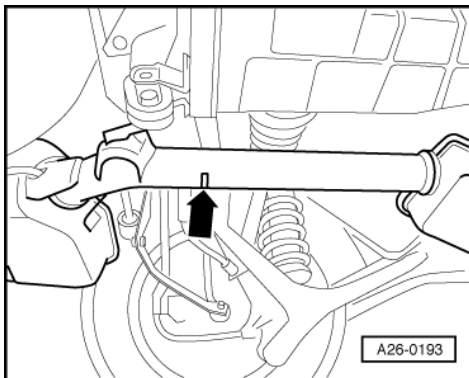
- -> Installation position of clamp -1-: horizontal, with bolted connections facing towards the rear
- Install the clamp so that the ends of the bolts are not below the bottom circumference of the clamp => Fig. 234.

Aligning exhaust system free of stress =>

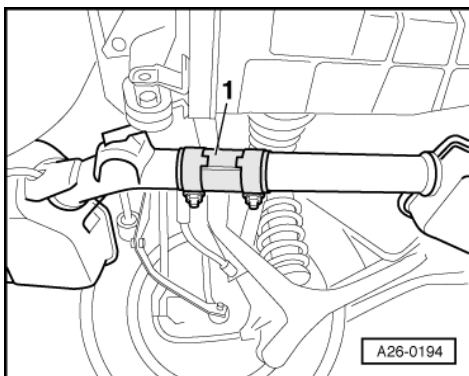
Page 238.

Tighten bolted connections on clamp evenly to 40 Nm.

Vehicles with four-wheel drive:



- -> Cut through exhaust pipes at right angles with body saw (e.g. V.A.G 1523) at the positions marked -arrow-.
- When installing, position clamps centrally over saw-cuts.



- -> Position of clamp: horizontal, with bolted connections facing towards left rear wheel.
- Install the clamp so that the ends of the bolts are not below the bottom circumference of the clamp => Fig. 234.

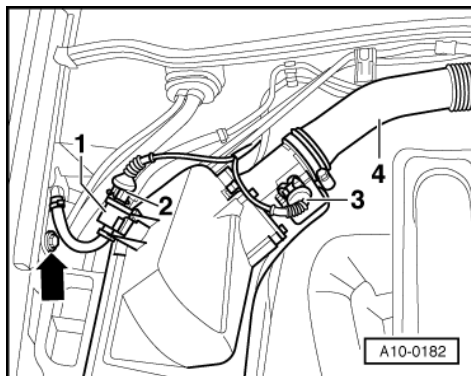
Aligning exhaust system free of stress =>

Page 238.

Tighten bolted connections on clamp evenly to 40 Nm.

1.5 - Removing and installing exhaust manifold

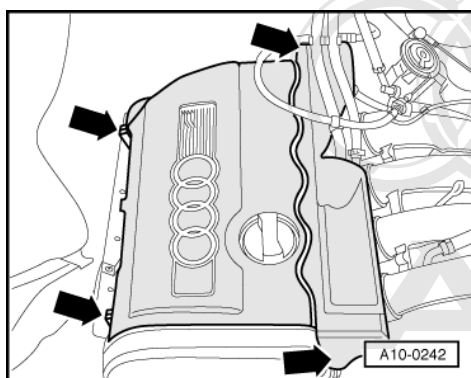
Removing



Notes:

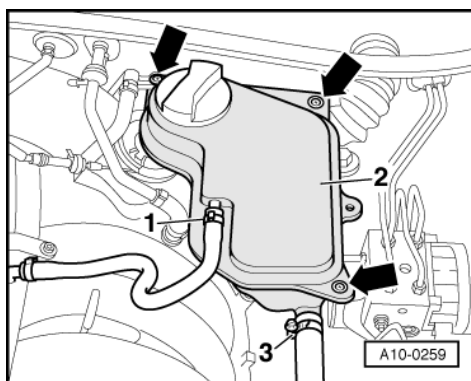
- ♦ Always renew seals, gaskets and self-locking nuts.
- ♦ The flexible pipe connection (de-coupling element) in the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.

- Remove cover above air cleaner housing.
- -> Unplug connectors -2- and -3- at air mass meter and ACF valve.
- Pull ACF valve -1- off air cleaner housing.



- Loosen bolt -arrow- and remove air cleaner housing together with air duct -4-.

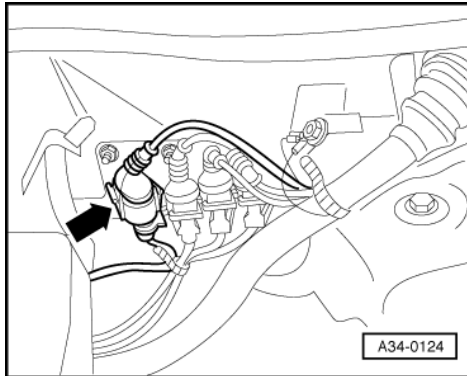
- -> Remove engine cover panels -arrows-.



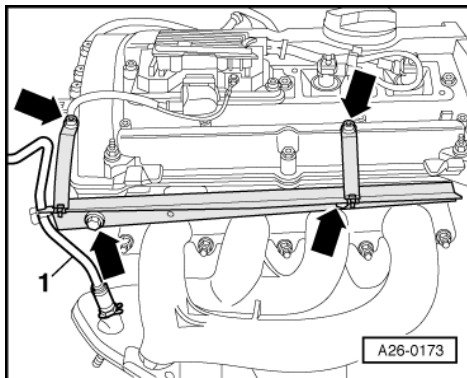
- -> Unbolt coolant expansion tank -2- (-arrows-).

Note:

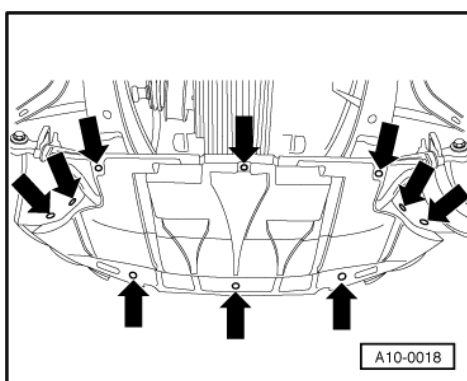
Coolant hoses -1- and -3- do not have to be disconnected.



- -> Disengage connector -arrow- for lambda probe from retainer. Unplug connector and move wiring clear.



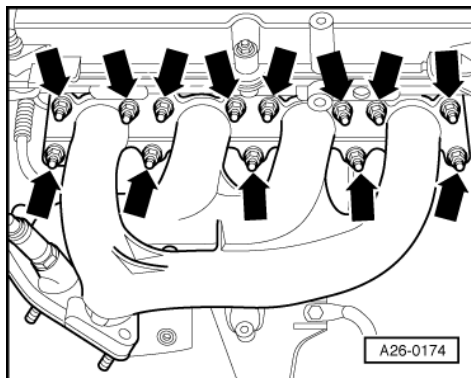
- -> Remove heat shield -arrows-.
- Unclip wire -1- for lambda probe and move wire clear.
- Unscrew bolts accessible from above securing front exhaust pipe to exhaust manifold.



- -> Remove noise insulation -arrows-.
- Unscrew bolts accessible from below securing front exhaust pipe to exhaust manifold.
- Push exhaust system towards rear of vehicle.



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- ➔ Unscrew all nuts -arrows- on exhaust manifold.
- Remove washers and exhaust manifold.

Installing

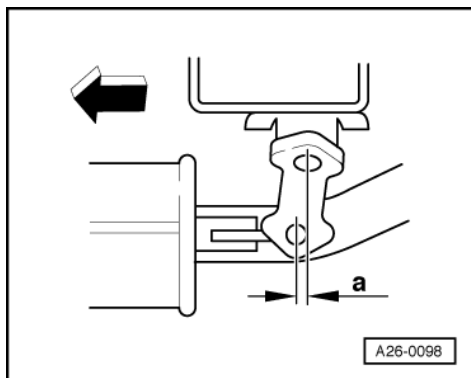
Installation is carried out in the reverse order, when doing this note the following:

- Grease threads of lambda probe with high-temperature lubricant G 052 112 A3. Apply lubricant only to threads of probe: the lubricant must not get into the slots on the probe body.
- Aligning exhaust system free of stress => Page 238.

Tightening torques

Components	Nm
Exhaust manifold to cylinder head	25
Front exhaust pipe to exhaust manifold	30
Heat shield to cylinder head	20
Heat shield to cylinder head cover	10
Lambda probe to front exhaust pipe	50

1.6 - Stress-free alignment of exhaust system



- The exhaust system must be aligned when cold.

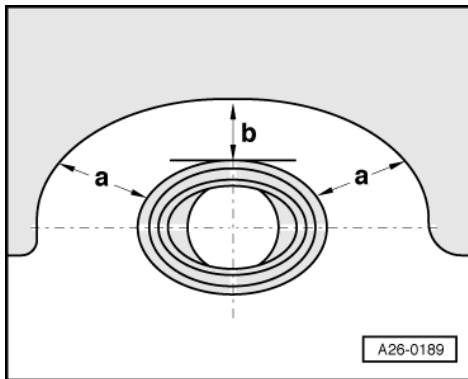
Vehicles with front-wheel drive:

- Slacken bolted connections on clamp -Item 225.
- ➔ Push exhaust system towards front of vehicle -arrow- so that rear mounting of rear silencer is pre-loaded by amount $a = 7 \dots 9 \text{ mm}$.
- Tighten bolted connections on clamp evenly to 40 Nm.

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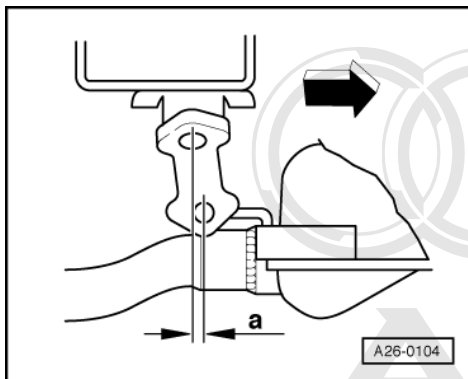
Aligning tailpipe



- -> Align tailpipe so that distance -a- is the same on both sides.
- At the same time, distance -b- must be obtained between bumper cutout and tailpipe:
 - Distance b = 33 ... 39 mm

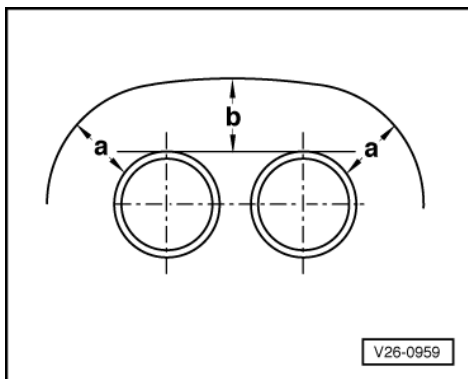
Vehicles with four-wheel drive:

- Vehicles without clamp between front and rear silencers



- Slacken bolts on clamp -Item 230.
- -> Push exhaust system towards front of vehicle -arrow- so that rear right mounting on rear silencer is preloaded by $a = 7 - 11 \text{ mm}$.
- Tighten bolts on clamp evenly to 40 Nm.

Aligning tailpipes



- -> Align tailpipes so that distance -a- is the same on both sides.
- At the same time, distance -b- must be obtained between bumper cutout and tailpipes:



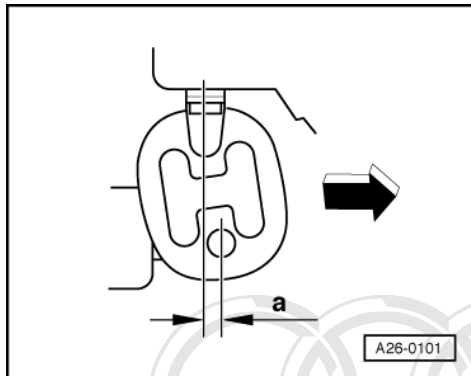
- Distance $b = 41 \dots 47 \text{ mm}$

- Vehicles with clamp between front and rear silencers

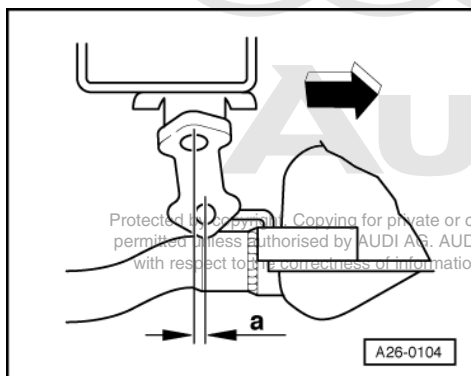
Note:

On vehicles with clamp between front and rear silencers the front silencer also has to be aligned. (This step is not required on other vehicles).

- Slacken bolts on clamps -Item **231** .

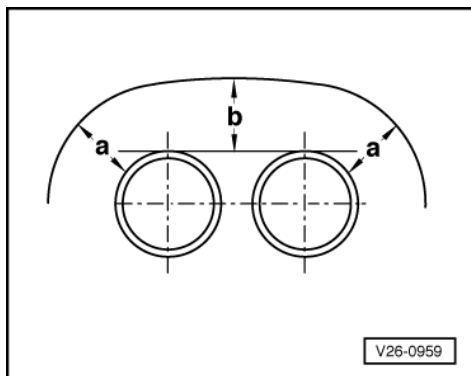


- -> Push exhaust system towards front of vehicle -arrow- so that rear left mounting on front silencer is preloaded by $a = 7 \dots 9 \text{ mm}$.
- Tighten bolts on front clamp -Item **230** evenly to 40 Nm.



- -> Push rear silencer towards front of vehicle -arrow- so that rear right mounting on rear silencer is preloaded by $a = 7 \dots 11 \text{ mm}$.
- Tighten bolts on rear clamp -Item **231** evenly to 40 Nm.

Aligning tailpipes



- -> Align tailpipes so that distance -a- is the same on both sides.
- At the same time, distance -b- must be obtained between bumper cutout and tailpipes:

- Distance b = 41 ... 47 mm

1.7 - Checking exhaust system for leaks

- Start engine and run at idling speed.
- Plug tailpipes (with rags or stoppers, etc.) until check is completed.
- Listen for noise at the connection points (cylinder head/manifold; manifold/front exhaust pipe; front exhaust pipe/catalytic converter etc.) to locate any leaks.
- Rectify any leaks that are found.



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